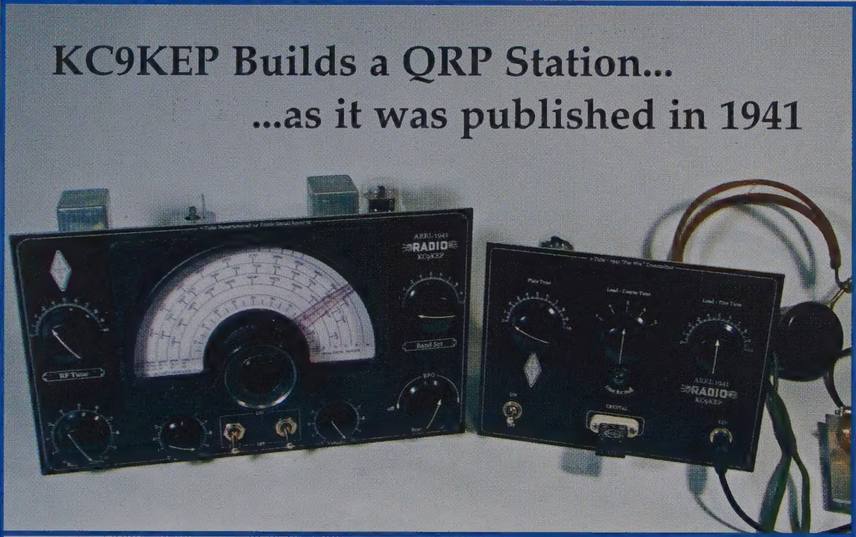
Your Construction and Operating QRP Sourcebook

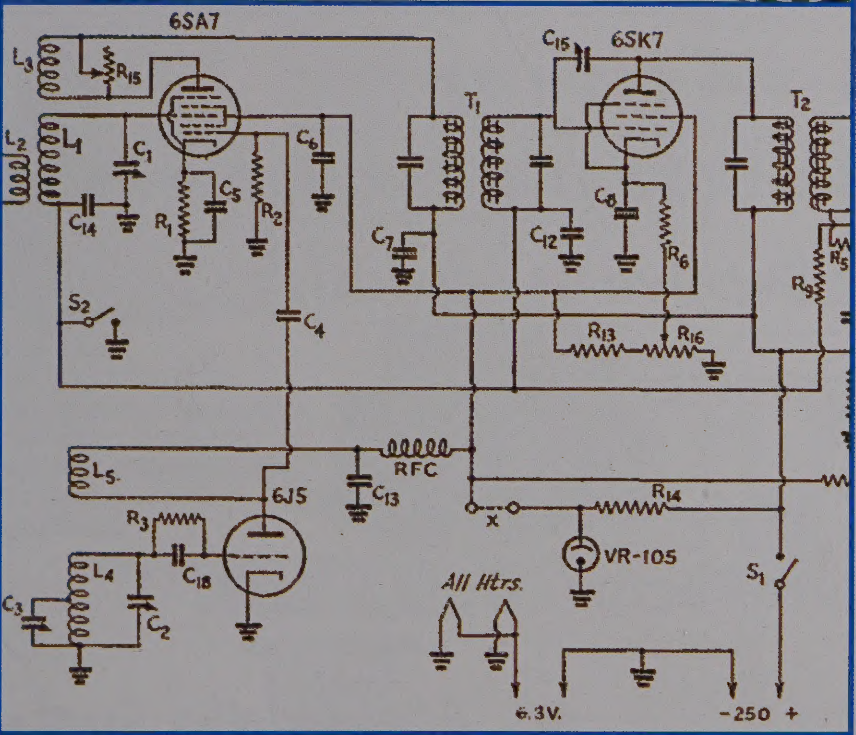
QRP Quarterly

Volume 52 Number 4
Fall 2011

Journal of the QRP Amateur Radio Club International

KC9KEP Builds a QRP Station...
...as it was published in 1941





- WG5G–A QRPer on the DXCC Honor Roll
- Build a 17M QRP SSB XCVR with N6QW
- N2CX's Portable Antenna "Classic" from 1997 FDIM
- Several Great Stories of QRP Operating Events
- Contest Results—
  2011 Hootowl Sprint
  2011 Milliwatt Field Day
  2011 Summer HB Sprint
  2011 Welcome to QRP Contest

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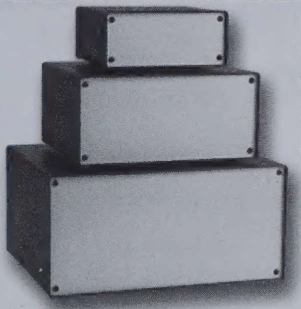

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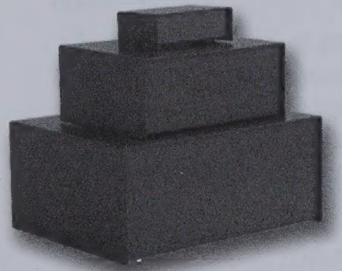

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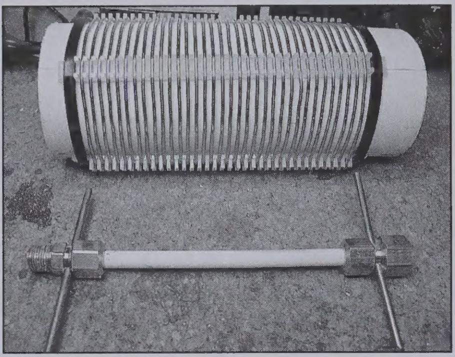

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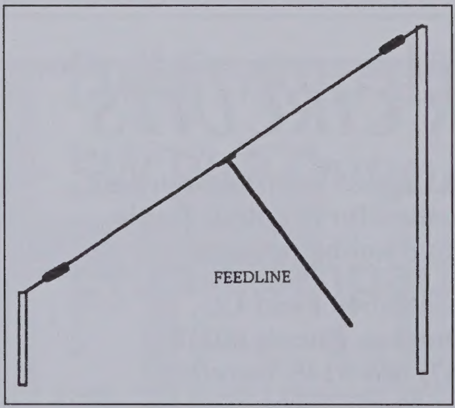

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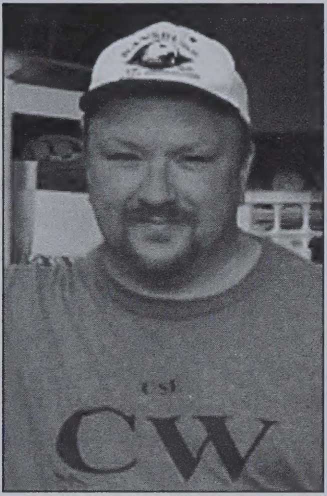
Editorial

Brian Murrey—KB9BVN kb9bvn@gmail.com



Dear fellow QRP ARCI Members,

This new Fall 2011 issue of the *QRP Quarterly* is the ninth issue I have had the pleasure of serving on as your editor. I have gotten to know a lot of good QRP loving people over the last couple years, and I have certainly enjoyed working with the authors, and the associate editors. I was surprised to find that my biggest challenge was not so much finding suitable contributions for publication, but finding the time to sit down and work with all the submissions and getting everything ready to send off to the publisher.

The staff that works on the *QRP Quarterly* from quarter to quarter is diligent, creative and hard working. They all strive to make the *QRP Quarterly* the best it can be. I was amazed at the efforts made by our publishing provider and shipping group to make sure everything was "just right" with the issue as well.

With that said, I have had to reconsider my position as editor here, I have more responsibility at work and at home now, and I just don't think I can put in the time that will be required to keep the *QRP Quarterly* flowing at the level we've all come to expect. We're in great hands though, as Timothy Stabler, WB9NLZ, has offered to take the reins of the magazine and move forward with it. Tim has been writing the QRP Clubhouse column for years, and it's one of the more popular segments we have in the magazine. I am sure that he will do a great job. He is going to continue writing the QRP Clubhouse column for the time being, and he is anxious to start talking to you about articles you would like to have submitted.

It looks like band conditions are showing signs of awakening, it's been a long period of less than optimal conditions, but I still hear QRP operators on the air, almost every night. You guys and gals are out there doing it with your minimalist rigs and wire antennas, every weekend, every contest, and almost every chance you get. We want to know about it. Write it up, send it in, and don't be bashful. The *QQ* staff is ready to help with the editing, grammar, and layout. Also, I know there are hundreds of you workbench operators out there, I talk to hams that say things like "I prefer building stuff to operating" all the time, I'm one of them. We want to see your projects; we want to see your improvements, and your ideas for new things QRP. Don't worry that you're not an EE. Then there are those of you out there that understand all this radio stuff far better than most of us, you have "the knack" on steroids. The QRP community needs you. Many of you have given us designs that we have been using for years and years, bringing new hams into the fold with your ideas that you have made so simple to understand through your writings and talks at various QRP events. The *QRP Quarterly* thanks you and needs your input as well. I know Tim and the *QQ* staff will continue to make the *QRP Quarterly* one of the best QRP magazines in the world. I have great confidence in them, and our readers. Thanks for all the fun!

73 de KB9BVN
Brian Murrey

On the Cover

This issue's cover features the tube-type receiver and transmitter projects from 1941, described in the article by Tom "Nick" Nickel, KC9KEP, "QRP, 1941 Style" that begins on page 20.

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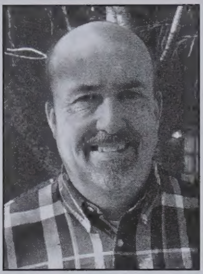

First, thank you for all the good wishes I have received in the past few months. Due to some family issues, I had to miss FDIM this year and the associated 50th Anniversary celebrations. The e-mails and cards received wishing me well are very much appreciated. Things have progressed and are improving. Thanks to all of you for your kind thoughts.

QRP ARCI 50th Anniversary

The attempt to activate the club call in all fifty states is going well. We have had stations on or scheduled from most all states using K6JSS and it appears we will get all fifty states activated by year's end. Contacts have been made using all modes on all bands, proving QRP can be used for any mode available to the radio amateur. As of his writing, there are still slots open for Louisiana and Nebraska. For current news on the schedule see http://www.qrparci.org/content/view/8371/118/. John Burnley, NUØV has volunteered to coordinate this effort for the club. If you wish to volunteer, send an email to John at burnleyj@gmail.com.

Some of you have missed one or more of the states. We will give you an opportunity to work those states during the last two weeks of the year. The details are in this issue. The intent is to get all fifty states activated during the last two weeks of 2011. So get on and grab that state.

One lesson learned from this experience is that the club call will attract attention generating activity from both QRPers and other ops. If you would like to use the club call for an activity, contact the trustee, Jim Stafford, W4QO at qrp@bellsouth.net.

Accessibility

One of the many positive aspects about amateur radio is that it is accessible to many regardless of physical abilities. Our club has members that have many different disabilities, but it does not prevent them from engaging in our hobby. In an attempt to make the things more accessible, the club has made the *QRP Quarterly* available in a screen readable format for our visually impaired members. This permits them to receive and "read" the *QQ* independently. In the future, we may be able to do more in making things more accessible.

Many of us enjoy building. There is a thrill in using a piece of equipment made with your own hands. Is it possible that our designers could create a kit that could be built by our visually impaired members? There are challenges, but a number think it doable. Could this be a challenge for an FDIM building contest? Please forward your thoughts to me on this subject.

—Ken Evans, W4DU
President, QRP ARCI

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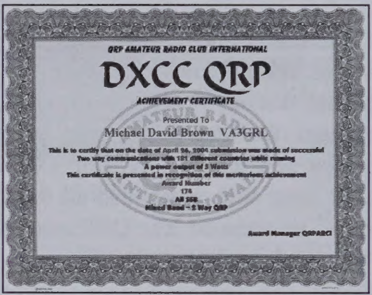
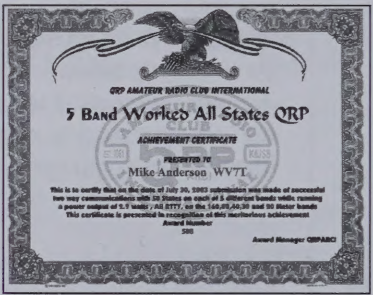
QRP ARCI Awards

Paul Stroud—AA4XX

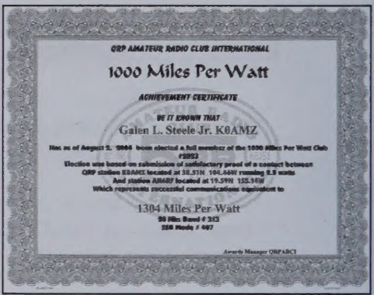
awards@qrparci.org



QRP AMATEUR RADIO CLUB INTERNATIONAL
DXCC QRP
ACHIEVEMENT CERTIFICATE
Presented To
Michael David Brown VA3GRL
This is to certify that on the date of April 26, 2004 submission was made of successful
Two way communications with 181 different countries while running
A power output of 5 Watts
This certificate is presented in recognition of this meritorious achievement
Award Number
174
All SSB
Mixed Band – 2 Way QRP
Award Manager QRPARCI



QRP AMATEUR RADIO CLUB INTERNATIONAL
5 Band Worked All States QRP
ACHIEVEMENT CERTIFICATE
PRESENTED TO
Mike Anderson WV7T
This is to certify that on the date of July 30, 2003 submission was made of successful
two way communications with 50 States on each of 5 different bands while running
a power output of 2.9 watts, All RTTY, on the 160,80,40,30 and 20 Meter bands
This certificate is presented in recognition of this meritorious achievement
Award Number
500
Award Manager QRPARCI



QRP AMATEUR RADIO CLUB INTERNATIONAL
1000 Miles Per Watt
ACHIEVEMENT CERTIFICATE
BE IT KNOWN THAT
Galen L. Steele Jr. K0AMZ
Has as of August 2, 2004 been elected a full member of the 1000 Miles Per Watt Club
[illegible]
Election was based on submission of satisfactory proof of a contact between
QRP station K0AMZ located at 38.51N 104.46W running 8.5 watts
And station [illegible] located at 19.59N 155.14W
Which represents successful communications equivalent to
1304 Miles Per Watt
[illegible]
[illegible]
Awards Manager QRP ARCI

First off, I'd like to recognize Jay Bromley, W5JAY, for his most able stewardship of the ARCI Awards Program during the past few years. Jay continues to serve on the ARCI BoD, as well as behind the scenes in a number of volunteer positions related to ham radio. Jay has set a high standard for the ARCI Awards Program, and it is my intention to maintain that same level of prompt, professional service, as your new ARCI Awards Manager.

The 1,000-Miles-per-Watt (KMPW) award continues to be the most popular award. So far this year, forty one KMPM awards have been issued, with applicants using a number of modes—CW, SSB, RTTY, JT-65, and PSK-31. Ed Worst, K9EW, is the current 2011 KMPW leader. Ed had a QSO with OK1KW while running 300 mW with his 20M Rockmite and a dipole for a whopping 15,166 MPW!

In January of this year, ARCI was pleased to award Ron Dodge, KØTC, the QRP All States Award (all CW).

Larry Jones, K5ZRK, has been quite busy confirming grid squares and has earned two Grid Square QRP Awards this year-one for 300 grids on 60M (all SSB) and the other for 200 grids on 30M (all CW).

A very impressive QRP All Continents Award was issued to Michel Boissonnault, VE2TH, in February. Michel earned this award on the magic band—50 MHz! (all CW). Michel also earned the Five Band QRP All Continents Award (all CW) in February.

ARCI offers a wide variety of awards. Full information on how to apply for the various awards can be found on the ARCI website. Award certificates are available free of charge to any QRP ARCI member with a current subscription to *QRP Quarterly* (otherwise $4 for USA applicants and $6 elsewhere).

If you have any questions or comments on the awards program, they may be addressed to me at awards@qrparci.org

—72, Paul Stroud, AA4XX

●●

Idea Exchange

Technical Tidbits for the QRPer

Mike Czuhajewsi—WA8MCQ wa8mcq@verizon.net

In this edition of the Idea Exchange:

Proper Antenna Installation (Quickie 79)—*N2CX*
Red Cheese Wax Holds Screws—*NV4V*
Homemade Kelvin Clip for Testing—*VK2TIL*
Catching Swarf When Drilling, Pemberton—*WB4UIV*
Another PCB Island Cutter—*AK2B*
Record Disassembly with a Digital Camera—*Tom Miller*
Precision PCB Drilling—*W1EH*
Workbench Cleanup Tips—*KU7Y, KK7CMC, K5KW, AC7ZN, K7GO*
Grommet Strips for Making Loading Coils—*AD5X*
Genuine HW-8 VFO Capacitors Available
Caution on Crystal Oscillator Can Transmitters—*WA8MCQ*

Proper Antenna Installation (Quickie 79)

Joe Everhart, N2CX, presents the latest installment in the endless stream of Technical Quickies he promised me years ago—

This Quickie is a departure from the usual fare. Rather than a simple handy circuit or workshop tip, it outlines an antenna installation. My good friend George, N2APB, recently asked me to help put up an antenna for a long-term friend of NJQRP, Nancy Feeny, NJ8B. The idea was to set up a multiband antenna for her in a new house in West Virginia.

Nancy wanted a solid no-fuss all-band HF antenna with good performance. To make things interesting there is a no-antenna restriction in her community so the installation had to be stealthy. However, as George pointed out “Doing it right the first time = years of good service!”

The best choice seemed to be a good vertical antenna that had fairly low visibility itself and a tilt-over base to hide the structure when it was not being used. To ensure best electrical performance an extensive ground radial system was needed and the tilt-over base was to be built from long-lasting material and solidly set in concrete in its mounting hole.

Figure 1 is a notional diagram of the mounting base adapted from a sketch by N2APB. The tilt-over base consists of three 2-inch heavy galvanized iron tubes for long life and structural strength. Two 3/8 inch threaded rods are used for the pivot and lock pins. The mounting base was solidly anchored in reinforced concrete to ensure antenna longevity. A hole was dug in the soil (more about that later) about a foot and a half in diameter.

Its depth was chosen for both mechanical stability and weather proofing. The minimum depth needed to prevent frost heaving was estimated based on Air Freezing Index information from Ref 1 and Table 4-8 of Ref 2. An AFI of 703 for nearby Martinsburg, WV works out to a recommended footing depth of 24 inches. Our goal was a hole depth of 3 to 3-1/2 feet to allow some rock fill under the concrete for drainage. As seen in Figure 1, three pieces of steel reinforcing rod were used both to help strengthen the concrete and to secure the base. They were driven diagonally into the hole walls and placed symmetrically around the mounting base.

The soil proved to be quite challenging! This location in West Virginia has heavy soil with high clay content. This is good from a strength perspective but makes digging holes quite laborious. A further complication is a high concentration of rocks ranging in size from an inch to 6 inches in size. Figure 2 is a photo of the hole taken during a rest break during the digging process.

We worked as a tag team using a pickaxe to loosen the soil, a length of pipe to loosen large rocks from the soil and a posthole digger to remove material from the hole. Progress was slow, taking several hours to complete the digging in 85 degree high humidity weather, primarily due to the large number of rocks. Some of the rocks can be seen in Figure 2.

Great care was taken to make sure that

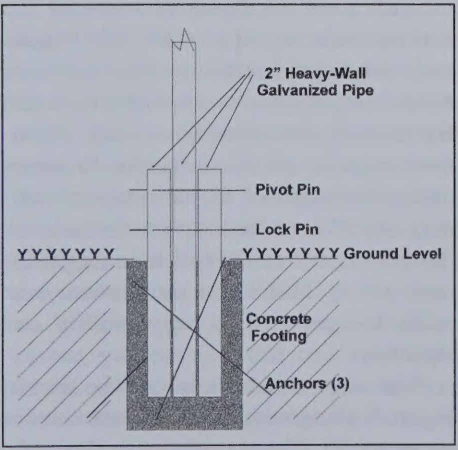


Figure 1—Tilt-over base mount.

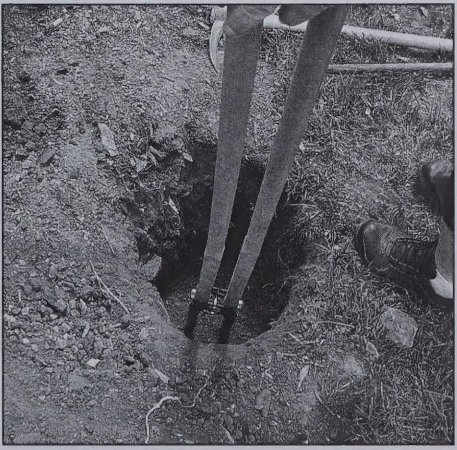


Figure 2—Antenna base hole.

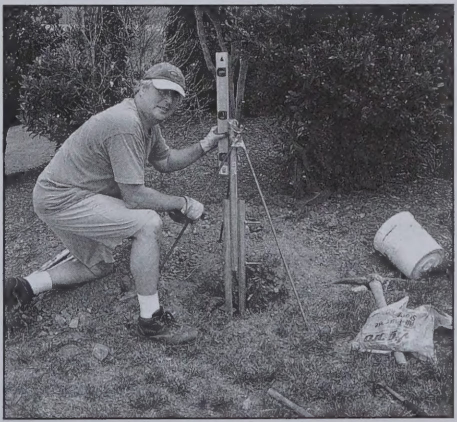


Figure 3—N2APB setting the vertical alignment.

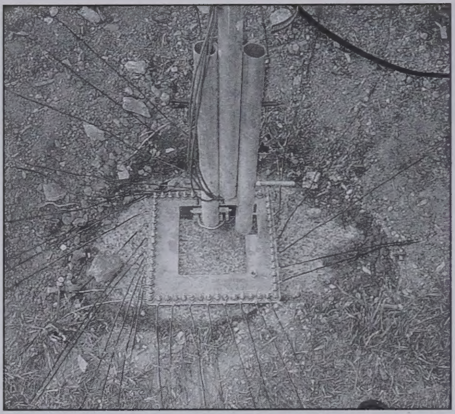


Figure 4—Base mount and radial plate.

the base was installed perfectly vertical—no sense in having a vertical antenna that listed like a drunken sailor. The first step was to drive the three lengths of rebar into the hole walls to hold the mast roughly in place. Next, three additional lengths of rebar were driven into the top of the ground 120 degrees apart and lashed to the mast. As shown in Figure 3, N2APB carefully adjusted the lashings and the rebar positions to ensure that a level held against the mast showed exact vertical positioning.

Quick setting concrete was used to set the base to speed the construction process (the whole job was accomplished in one day). We used a product called Sakrete™ since it was available locally, though Quickrete™ would have proved just as effective. Both promise to set hard in less than a half hour and to provide usable strength in several hours as opposed to 24 hours or longer for ordinary concrete.

The directions provided call for simply pouring the dry concrete mix into to the hole and adding a prescribed amount of water. When we did this the dry mix and water did not seem to mix at all, so we used a long stick to actually stir the materials in the hole. Our concern was that incomplete self-mixing could cause an inadequately strong base. We broke for rest and a meal after pouring the concrete, then verified that it had set quite well after several hours.

A proper ground system is essential for correct operation of the Butternut vertical as with most ground mounted designs. Unlike many verticals using traps and other multiband techniques, the Butternut operates with DC continuity to ground. Two types of ground connection are required. The first is a good earth connection using ground rods. This provides a path to discharge any static charge that builds up on the antenna. However this type of ground is ineffective in providing a low-loss RF ground. Numerous radials are required to get high efficiency operation. Just how many to use is always subject to much discussion. Good guidelines can be found in Ref 3, written by Rudy Severns N6LF.

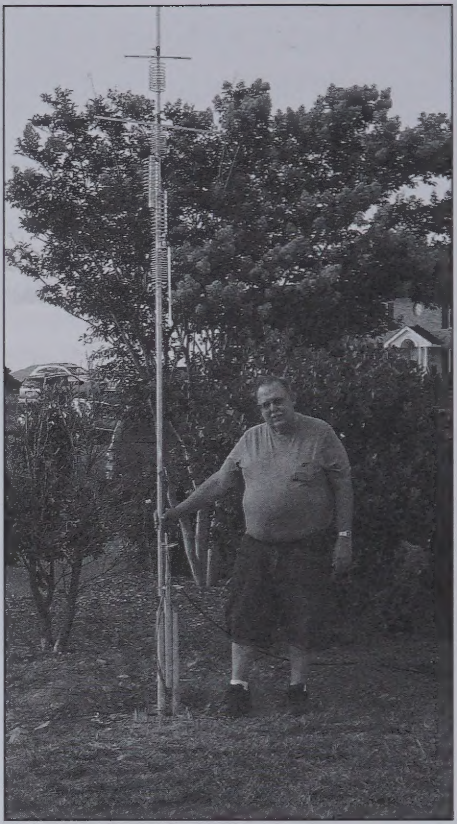


Figure 5—Final installation view, including a very tired N2CX.

Making solid ground connections to the antenna and feedline is quite important. We used a DXE-RADP-3 Ground Radial Plate made by DX Engineering (Ref 4). The stainless steel plate is supplied with 20 ground radials and corresponding stainless steel hardware. It is shown attached to the antenna mounting base in Figure 4. A number of the ubiquitous rocks also appear in the picture. Careful readers may notice several wires connecting the bottom of the vertical antenna to the ground plate. Their several foot length was an area of concern since we feared that the added length might affect antenna tune-up and operation. Use of several 8 gauge wires in parallel gave low enough resistance and inductance that our concerns were (pun intended) groundless.

Ideally one or more 8 foot ground rods should be used for the static-discharge ground. However, due to the numerous rocks in the soil we were unable to hammer our rod that deeply. The rocks were so numerous and strong that we risked bending the rod by using a sledge hammer. What we did was to cut the 8 foot rod into two 4 footers. Each of these was driven using the sledge hammer. It took several trial locations for each before a suitable, fairly rock-free place was found. Proper ground rod clamps connected heavy gauge wire to each rod and the other end of each ground rod wire was connected to the radial base plate.

You can also see the ground radials attached to the base plate. Additional radial wire and stainless steel hardware from DX Engineering was used for a total of 31 radials, ranging in length from 20 to 60 feet, depending on available space in the yard and proximity to NJ8B's house. In past years most ground radial systems were laboriously buried in trenches radiating out from the base of the antenna. These days a common practice is to stretch the wires out and secure them with wire staples. These are six inch U-shaped stiff wires that are hammered into the ground every 3 or 4 feet to hold the radial wires in place.

In time the radials sink into ordinary yard grass and become covered by the resulting thatch. The staples are available from DX Engineering, although some thrifty hams cut up metal coat hangers to roll their own. In this installation the ever present rocks meant that pounding the wire staples was a frustrating trial and error process.

The final step was to tune the Butternut on each band by means of adjusting the various inductor taps, wire stub lengths and resonator locations. This iterative band-by-band process is outlined in the Butternut instructions. Since each adjustment requires access to various locations along the length of the antenna, an ordinary installation means that the antenna has to be removed from its base mount for each setting. In this case the tilt-over base made this process go very quickly and smoothly.

The as-installed antenna can be seen in Figure 5 along with some six foot random character for a height reference. The location chosen for the antenna placement has a stealthy character not previously mentioned. Tall shrubbery in nearby landscaping neatly hides most of the "busy" part of the antenna from view from the nearby street even when the antenna is in its upright position. When it is in the "down" position it is completely screened.

As mentioned above the installation was completed in a single day. This did not allow for much opportunity to evaluate how well the antenna worked. A month of casual operation by Nancy, NJ8B, has verified that it does indeed work flawlessly and no neighbors have yet complained about it. We are confident that the care taken in the job will indeed give her many years of good service.

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2. Footing depth values: Table 4-8 in: http://www.huduser.org/Publications/pdf/residential.pdf

3. Design of Ground Radial Systems: http://www.antennasbyn6lf.com/design_of_radial_ground_systems/

4. DXE-RADP-3: <http://www.dxengineering.com/Parts.asp?ID=4866&PLID=47&SecID=109&DeptID={1EF0B53E-21FE-4C78-BBFD-DEA06A2B6B6D}&PartNo=DXE-RADP-3>

—DE N2CX

Red Cheese Wax Holds Screws

Sent along by Pete Burbank, NV4V—

Here's a useful item that should be part of every homebrewer's bag of tricks. I've never seen it in print but it's probably in "Hints and Kinks" somewhere.

In my first "real" job in a radio/TV shop, W0CRY (the Boss) showed me a useful technique for holding screws and nuts on your tools for starting in hard to reach places. Tubular capacitors often were covered with a sticky wax coat and a quick swipe with the end of a screwdriver or nutdriver was sufficient to pick up enough wax to hold the screw or nut while you started it on the thread.

With modern plastic capacitors, of course, you can't do that so I've found a useful substitute. The red wax covering Gouda cheese is quite sticky and very useful for holding any type of screw on the end of your screwdriver or even holding a nut in a hard to reach place, such as under a chassis. You can keep a small ball of wax in a baggie in any toolbox. Eat the cheese first!

—DE NV4V

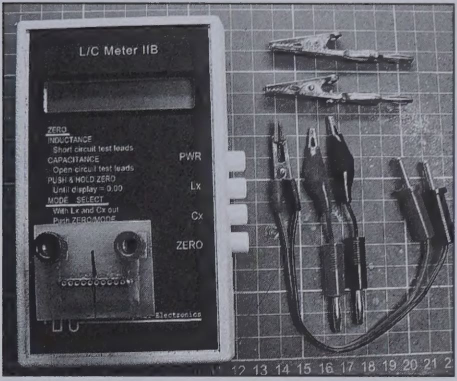


Figure 6—AADE LC meter with VK2TIL accessories, including a Kelvin clip.

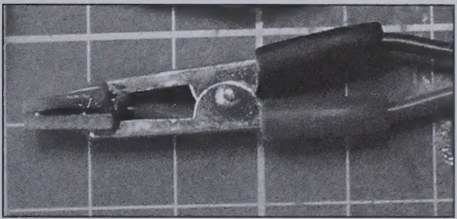


Figure 7—Pads of double sided PCB material soldered to the alligator jaws turn it into a Kelvin clip.

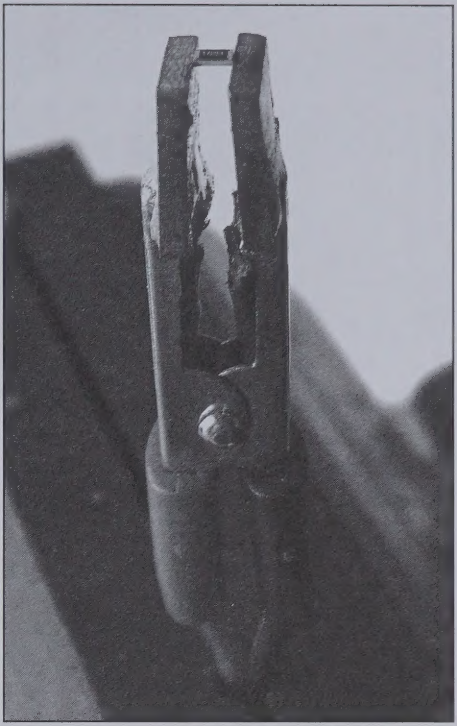


Figure 8—The clip easily holds SMT components; the one shown here is size 0805.

Homemade Kelvin Clip for Testing

This is one of the more esoteric test equipment accessories, but very useful when you need it. If you have ever done 4-wire resistance testing you may have used these. Think of an alligator clip in which the two jaws are insulated from each other, and a lead goes to both of them.

Something like this also comes in handy as an accessory for a multimeter or other test device when measuring surface mount components. You just clamp onto the part to measure it. (In fact, AADE sells a kit of parts to make this accessory, using an actual Kelvin clip, for their LC meter.)

Kerry Power, VK2TIL posted a link on the N2PK-VNA forum on yahoo.com, to an online photo (Figure 6) of his homemade Kelvin clip, used as an accessory for the AADE meter. The combination of the clip and the AADE is the functional equivalent of those "smart tweezers" LCR devices that some folks sell.

His version uses an ordinary alligator clip, as shown in Figure 7. The two jaws remain shorted to each other by way of the pivot point, but he adds insulated contacts made from double sided PCB material attached to the ends.

Adapted from his online post and private mail—

There is a home-made Kelvin clip to the right of the meter; it consists of two little pads of double-sided PCB material soldered to a standard alligator clip. Wires are soldered to the isolated sides of the pads and terminated with plugs to match the meter.

A "step" is filed in each jaw to accept the PCB "plates", which are about 1/4" wide and 3/8" long (although they could be any size the builder wishes). Each side of the plates is tinned with solder.

The component being held in Figure 8 is a 0805 surface mount resistor that was easily picked up from the bench by the clip. The slight convergence of the two PCB "plates" and their square-filed edges allow this. *[Although the AADE does not measure resistance, the clip can also be used with a multimeter for measuring resistors.—WA8MCQ]*

Kerry also supplied the photo of Figure 9 with these comments—

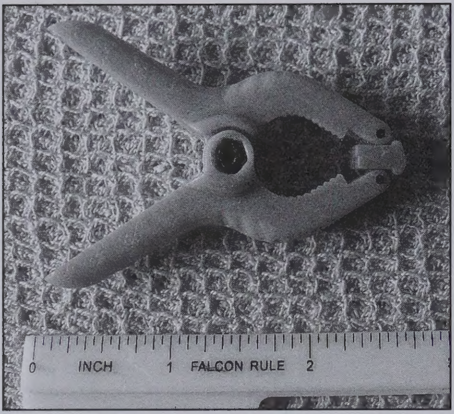


Figure 9-An inexpensive plastic clamp (not yet modified) can be turned into an RF current sensor or a Kelvin clip.

You often see these little plastic clamps in hardware and $2 shops; quality varies but some are quite good. I plan to use this one for a home-made RF current clamp using a toroid sawn in half but it would also make a very good Kelvin clip. Other possibilities are the large plastic "paper clips" that are seen in office supply shops and sometimes the ubiquitous $2 shops. *[in the US we call them "$1 shops."—WA8MCQ]*

—DE VK2TIL

WA8MCQ comments—When using the AADE meter to measure capacitance the first thing you do is zero it with your fixture or test leads connected, to null out the residual capacitance. I haven't built one of these Kelvin clips yet so can't speak from experience, but you obviously have to spread the pads apart a bit so they aren't shorted together when zeroing. The question is how much, and how to keep them at that spacing while calibrating. (This is not an issue when measuring inductors, in which case the meter is zeroed with the test leads shorted together.)

Keep in mind that whatever spreads them apart has a certain dielectric constant (*K*) which affects the net capacitance between the pads, and will be different from the constant of air. Say you calibrate it by holding it apart with a piece of bare FR4 fiberglass (PCB material with the copper removed). If the FR4 is removed but the plates remain at the same distance, the capacitance will be lower since the dielectric constant of air is about 1/4 that of FR4, introducing a certain amount of error. And if you measure an SMD component which requires the pads to be a bit farther apart there is also some error. But is it worth worrying about?

Probably not, which I decided after giving this a lot of thought and crunching a lot of numbers using an online parallel plate capacitor calculator. The amounts are small enough as to be pretty much irrelevant in just about all cases. (The calculator I used is at http://www.daycounter.com/Calculators/Plate-Capacitor-Calculator.phtml. It allows both metric and inches to be used, which is handy, and includes a table of dielectric constants of various materials. If you go to the web page home and look at the Site Map you might find some other things of interest as well. And be sure to scroll down; it's a very long list.)

What I plan to do when I build one of these is do the calibration with a piece of 1/16" thick PCB material with the copper removed, and insert it about 1/16" into the jaws, enough to hold it apart but have minimal effect due to the higher *K*. Most of the gap will be air, as it will be when measuring components. Using the size of the VK2TIL pads, the added capacitance due to the tiny bit of FR4 is very small, calculated at 0.1686 pF. With just an air gap of 0.0625" the capacitance is 0.3372 pF, and with the bit of FR4 added it's 0.5058 pF. Zero the AADE meter with this. (If the FR4 is inserted fully to cover the entire pad area, the capacitance would be 1.3488 pF.)

With a spacing of 0.080" (as when measuring an 0805 component) the capacitance of the plates (with an air gap) is 0.2634 pF, or a difference of 0.2424 pF from the zero value. Spread the plates to 0.120" (1206 component) and the deviation is 0.330 pF. In just about all cases you can ignore this, and if you are doing measurements where this amount of error is significant, you really should be using much more precise instrumentation.

Catching Swarf When Drilling

That's probably a word not too many people know and I even had to add it to my spell checker. It refers to the chips and other debris from metalworking, such as milling, grinding and drilling. All of the machinists at work know it, though. (Swarf also refers to shavings, sawdust, etc when working with wood.)

We usually aren't too concerned about it when drilling since it can be cleaned up easily later. However, when drilling a hole in an existing piece of equipment it's best to catch it if possible before it gets spread around inside and becomes much more difficult to remove, just waiting to cause damage or shorts. The topic came up on the "hp_agilent_equipment" group on yahoo.com when someone talked about drilling out threaded metal inserts that had become stripped. (It also applies to drilling new holes, of course.)

Phil Pemberton had this suggestion—

Cut off the bottom of a drinks can, tin can or plastic Coke bottle, then place it inside the equipment under the threaded insert you're going to drill out—this will stop most of the swarf from going inside.

Glenn Little, WB4UIV, followed up with this—

While in the US Navy, one duty station was POMFLANT. This is where we maintained and built missiles. When we had to drill into the missile body, we used modeling clay on both sides of the place to be drilled. We would drill through the clay, which would catch the drill swarf. When the hole was completed, we would remove and discard the clay. This left no FOD *[foreign material]* in the missile and worked rather well.

WA8MCQ comments—Whenever I drill a hole into metal where I don't want the chips to go, I cover up the far side with whatever tape is handy at the moment. I've used duct tape, electrical tape, kapton tape, even ordinary Scotch tape. The trick is to use a few pieces to completely cover the surrounding area and make a bit of a pouch, and carefully control the drill penetration so the bit doesn't puncture it and let some of the chips out.

Another PCB Island Cutter

A variation of the popular Manhattan construction technique involves using a small circular cutter to make isolated islands in the surface of a piece of unetched PCB stock. Here's one version, from a post to QRP-L by Tom Hall, AK2B, plus private mail—

I bought one of the diamond pad cutters but found it needed to be used in a drill press to keep it steady. The idea for my version of an island cutter came from two sources. The first was from Eric, KE6US, who suggested using brad point bits to cut holes in the infamous Altoids tin.

The other was from Tony Fishpool, G4WIF, who sent me a picture of a hand tool he used to create circuit board pads. His bit didn't have the center "pin" like my tool but used the outer edges of a drill bit to cut a pad. Unfortunately, I lost the picture but I found that he calls it the "Hand Held Pad Cutter" (which can be found in a book called *Simple Test Equipment for the QRPer*).

When I saw Tony's picture I immediately thought of the brad point bit and cutting it down to make something I could use in my hand held drill. I got the idea from the two that I could do the same thing if I "hollowed out" the area between the points. Figure 10 is an unmodified brad point bit (which you can buy at Home Depot, etc), Figure 11 shows the modified bit, and Figure 12 shows a board built with the resulting pads.

[WA8MCQ note—Figure 10 is my photo. Since some people may not know what an unmodified brad point drill bit looks like, I went to Home Depot to get one. I included the package to make it easier to find. At this store they only had a few individual sizes and a set of 6.]

I used a Dremel Tool and a cutting wheel to remove unwanted material. I got the bits in a pack of three sizes. The one I use is a quarter inch, which was the largest of the three. I tried grinding down one of the smaller bits but had no luck getting it fine enough so that it cut a small enough outer circle.

I use this modified brad point bit in my handheld drill. It makes putting together a small circuit a breeze. I even use it for surface mount components. I now find it the weapon of choice for circuit building.

It is very fast and forgivable—if you don't get everything where you want it, just make another pad. I usually try and lay out a circuit with a marker, make the pads, sand down any rough edges and then build.

—*DE AK2B*

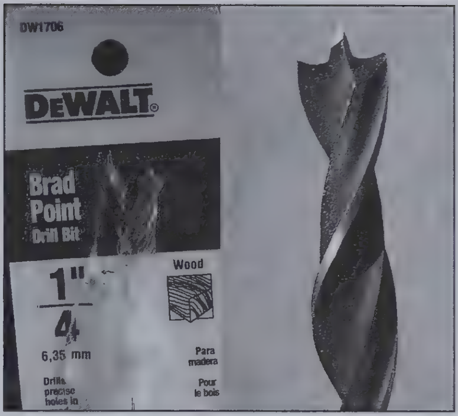


Figure 10—Unmodified brad point drill bit. The point in the middle keeps it centered when starting a hole in wood or soft material.

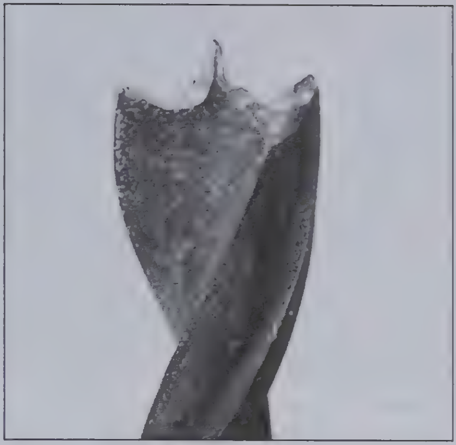


Figure 11—Modified brad point drill for cutting PCB islands.

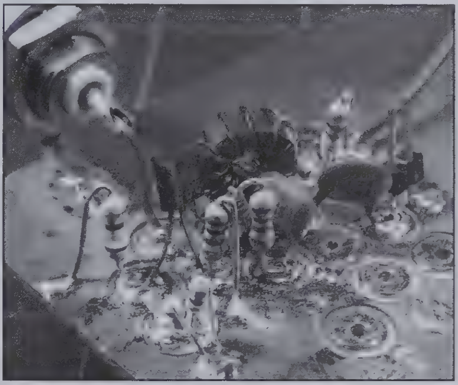


Figure 12—Board built with islands made with the AK2B tool.

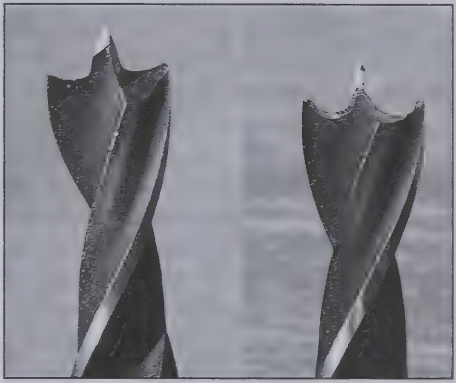


Figure 13—The unmodified bit (left) would cut islands but not too well; the modified one (right) does it much better.

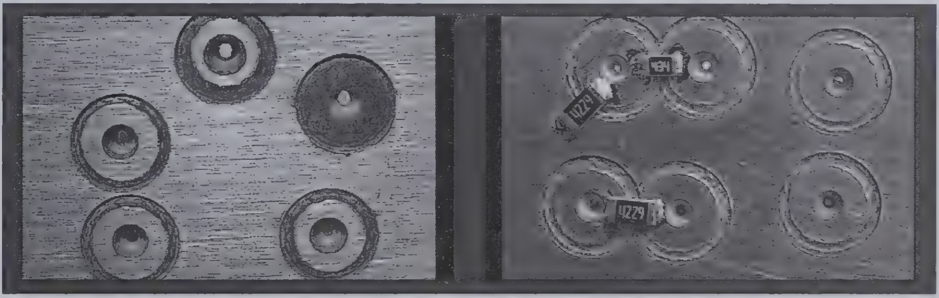


Figure 14—Islands made with unmodified bit (left) and modified one (right).

WA8MCQ comments—I've never done either Manhattan or islands myself but couldn't resist going to Home Depot and picking up one of these. They didn't have a set of 3 sizes, but did have a pack of 6, plus several individual bits. I got one of the 1/4" ones. I added figure 10 since I'm not sure if everyone knows what a brad point bit is and what to look for on the shelf. (I never used one before in my life.)

I put it in a small bench vise under my stereo zoom microscope at work and cut into it with the Craftsman equivalent of a Dremel tool. It was really easy to get good, precise control of the cutting tool that way. Figure 13 shows my bit before and after modification.

Before modifying it I put the bit in a drill press and cut a few test islands in a piece of scrap PCB stock. As I suspected from looking at the unmodified drill, it would cut islands straight out of the package but it wasn't very good. The modification really is necessary. It was rather tricky to control the cuts and get consistent results; it was easy to go too far by mistake and cut out a 1/4" empty spot with no copper, and the center hole was larger than I'd like. The range of motion between just starting to make an isolating outer ring and complete disaster was very small. The modified one was a lot easier to use and results were much better and more consistent. Figure 14 shows the islands made before and after modification.

Tom mentioned that a 1206 size SMD component can be placed between two pads, so I added a few. The two marked 4229 (42.2 ohms) are 1206 and the 434 (4.7 megohms) is 0805.

I don't normally care for Manhattan pads, island cutters and all that, but now that I've got my hands on one I think I'm a convert.

—DE WA8MCQ

Record Disassembly with a Digital Camera

This comes from the "why didn't I think of that?" file by way of one of the Tektronix scopes forums on yahoo.com. Some folks were discussing disassembly of a plug-in to clean cam switch contacts, and Tom Miller had this suggestion:

"Be sure to use a digital camera as you disassemble everything so you can tell how to put it back."

Digital cameras have been around for years, everyone has them, results are instantaneous and the "film" is free and unlimited. I've done it myself many times over the years, on electronics, vacuum cleaners, cars, etc, and it's paid off handsomely several times during reassembly.

When you take something apart you know that when you reassemble it everything will be obvious, nothing will be missed, lost or forgotten, and it will go together smoothly. Unfortunately it doesn't always work that way. That's where the camera makes life a lot simpler.

The most recent time I took photos was during some extensive disassembly of my HP 8640B signal generator for repair and evaluation of the filter board. (If you've ever done that, you know how deeply the board is buried.) I had removed some stacked shielded subassemblies, their covers and circuit boards, which entailed taking out a large number of screws, many of them just slightly longer than others. There were also several semi-rigid coaxial cable assembles with connectors.

Since a few weeks had passed between disassembly and reassembly, having a photographic record of which screw and cable assembly went where was priceless. You think you'll remember everything a day or two later when you put something back together again, and most of the time you'll be right. But sometimes you'll be really glad you had the pictures, especially when the days drag out into weeks.

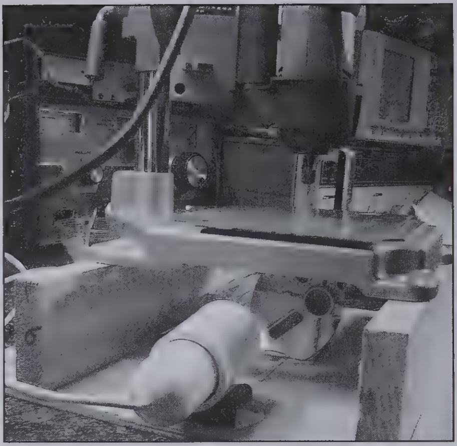


Figure 15—The CCD microscope is aimed at a mirror, allowing it to see the underside of the drill press.

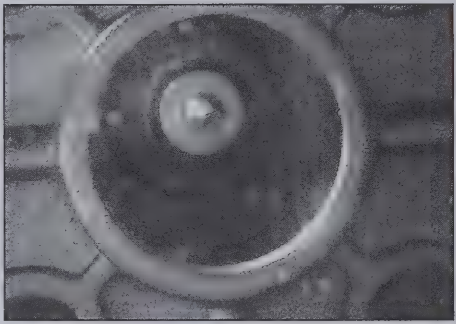


Figure 17—Looking up at the drill through the bottom of the drill press.

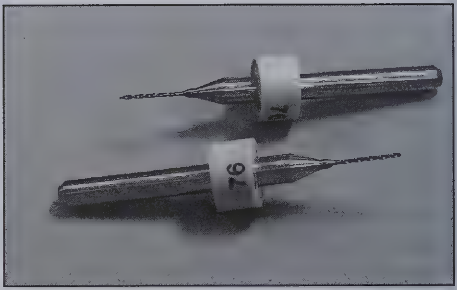


Figure 16—Typical high speed PCB drills. The shank is 1/8".

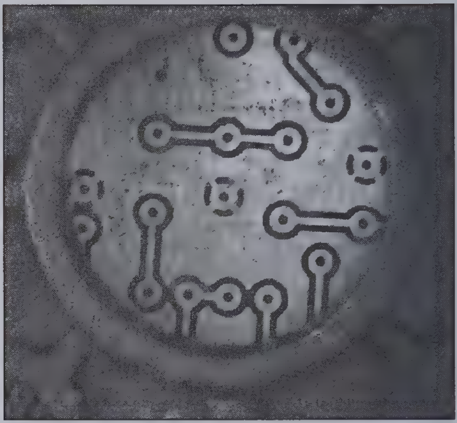


Figure 18-- Looking up at a PCB. (Lighting is supplied by the CCD microscope.)

Precision PCB Drilling

Sent along by e-mail from Chris Schenck, W1EH:

After much trial and error, I am able to make excellent PCBs using a Dell 1700 laser printer, Press N Peel Blue sheets, and a bubble etching tank. However, poor eyesight has made it difficult to drill the holes with precision and repeatability. Even after obtaining a Dremel drill press stand and hand-held, USB powered CCD digital microscope (Dino-Lite Basic) which plugs into a computer and gives a large, easy to view display, vibration and parallax error prevented me from making consistently precise holes.

The Homebrew-PCB Group on yahoo.com offered much good advice. Some individuals remembered that commercial PCB shops often installed their drills beneath the work platform, allowing the operator to use a microscope from above. Another suggested installing a "front surface mirror" [also known as a "first surface mirror"] at a 45 degree angle around the drill. Placing the CCD camera directly under the drill was also offered as an option.

While all of the above suggestions would work, they were not very practical given my particular equipment. Raising the drill press up 2.5 inches and installing a cheap hand mirror at exactly a 45 degree angle solved the problem.

The Dino-Lite Basic CCD microscope can be press fitted into a 1 1/4 inch I.D. PVC coupling which is secured to the wood base (lower center, Figure 15); it can be easily removed later for other tasks like soldering SMD parts. (Everything in the photo is glued or screwed together.)

Figure 16 shows a couple of typical high speed PCB drills, to help you understand what you're looking at in Figure 17. That is the view from the underside of the drill press bed, which the microscope sees and sends to the computer screen. The tip of the drill bit is not clear, as it is viewed dead on.

The PCB to be drilled is placed face down on the work stand; Figure 18 shows the view from underneath, and Figure 19

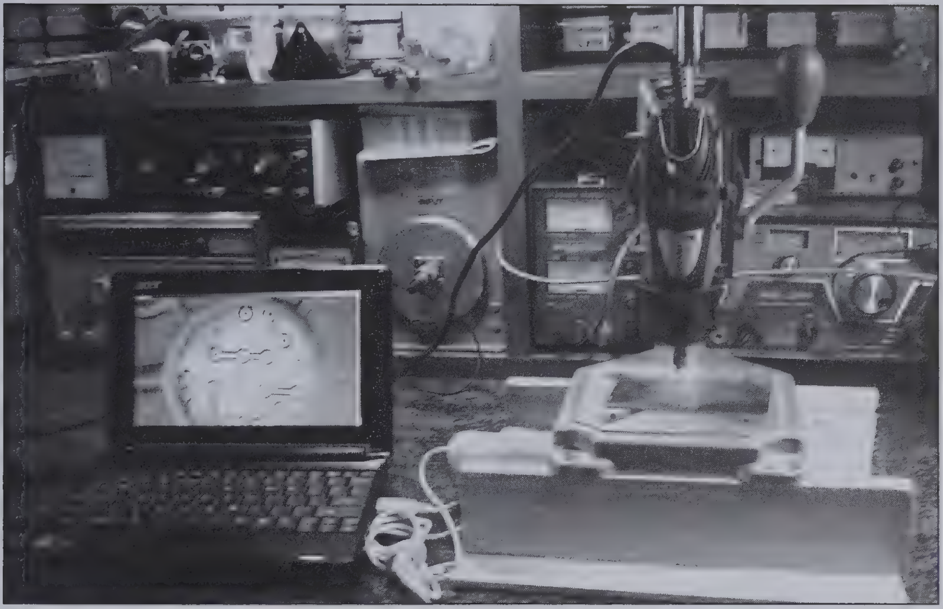


Figure 19—Overall setup, with the CCD microscope image on the computer screen.

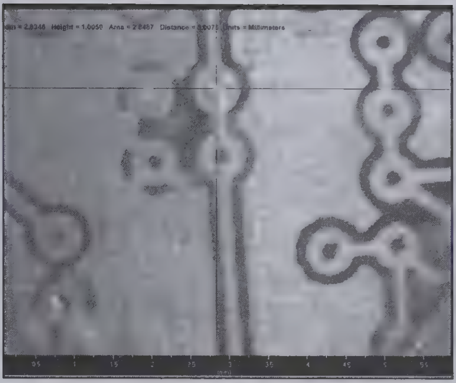


Figure 20—Other software displays cross hairs at the hole location.

shows the overall setup at this point. More magnification could have been obtained by moving the CCD closer to the mirror. However, I opted for a little less magnification and a broader field of view.

Before drilling the actual holes, temporarily put a piece of scrap PCB material on the drill press bed, or move the real board to an open area without traces or pads where a test hole can be drilled. The location where the drill breaks through the PCB is viewed on the computer screen and the point is marked with the computer cursor (or cross hairs, depending on the software). The drill will always come down at this place.

Move the board around so the locations of the needed holes are at this spot and drill them one by one. As long as the drill press, microscope and mouse are not moved, calibration does not need to be repeated often. Figure 20 shows the end of the drill sticking out of a hole which is right at the cross hairs. The hole to the left of the cross hairs was already drilled.

The cross hairs, etc, were done using software I found later, a 21 day trial version of scientific software designed for use with the Dino-Lite. It has a moveable cursor and also a zoom function. It is called ITL Scope and can be found at http://www.logint.com.au/downloads.htm. This is a big improvement over the software included with the Dino-Lite Basic. The crosshairs are independent of the cursor. (Unfortunately, the cursor does not show on the Dino Capture Lite software.)

This same setup may work with an optical microscope and cross hairs on the mirror. However, a means for lighting the underside of the drill platform would have to be devised, as my CCD microscope includes LED illumination, which is reflected to the PCB by the 45 degree mirror. Note that I get good contrast either using etched boards or those coated in Press N Peel Blue. Now that precision holes are possible, making double sided boards is much easier by drilling all the holes on the underside first, then lining up the top layer using a needle.

[WA8MCQ notes—More info on the CCD microscope can be found on www.dino-lite.com. The basic version he has is model AM2011 and has resolution of 640 x 480 or 0.3 megapixels. They have several other versions, as high as 5 megapixels. Some of their products are available on amazon.com and microscope.com, and the basic model is about $100.

Info on the Press-n-Peel Blue transfer film, which I have never used myself, can be found at www.techniks.com. The web page says that the sheets have release agents and resist coatings on them. Print your artwork on it with a laser printer or photocopier (dry toner based), then iron or press it onto a clean, unetched piece of PCB material and lift the film off. The printed image is transferred to the board along with the blue resist material.]

—DE W1EH

Workbench Cleanup Tips

Several tips were posted to QRP-L a while back. First, from Ron Stark, KU7Y, former editor of the *QRP Quarterly*—

I was sitting here looking at the mess on my workbench. I've been making some coax jumpers and had a lot of little pieces of shield wire laying around; no way to sweep or pick them up. Then a little light bulb went off in my head.

I saw a roll of duct tape sitting there. I took a little piece of it and used that to pick up all that small "stuff"! Worked great.

Here's something else that might be of interest, for those of you who can't afford one of the nice antistatic mats. Now don't get your hopes up because these mats are not antistatic but still nice to work on.

Look at floor mats in your local store; I got mine at Wally World. Don't worry about the "good side" but turn them over and look at the bottom. Choose one that is like rubber. I have no idea what they are really made from but they are heavy and great to work on. If you keep them clean they don't hurt those nicely painted boxes you put your projects in, either.

—DE KU7Y

KK7CMC, Carole A Carriker, responded with this—

I use a clothes "lint roller" to clean up small bits of trash. It's basically a roll of masking tape; not as sticky as duct tape, but it works. The tape is in a roll with the sticky side out, and it comes attached to a plastic handle which makes it easy to use. You can find them at the grocery store, usually in the aisle where you find laundry supplies.

—DE KK7CMC

From Don Foster, K5KW—

I'm partial to discarded carpet samples to protect my equipment while on the workbench. The nap side up is nice for protection, the nap side down (using the rough back side) is great to hold grungy stuff or while soldering.

—DE K5KW

From Glenn Dixon, AC7ZN—

A couple of years ago I worked with the tiny antenna switches used in cell phones. To keep capacitance low these devices had no static protection and just looking at them seemed to damage them. Smocks, wrist straps and antistatic mats were not enough. My workbench was in a carpeted area and the carpet and the fabric on my chair generated enough static to blow them even when the other measures were used.

I became a convert to StaticGuard™ spray. I sprayed my workbench, chair and carpet once a week (then cleared out for 1/2 hour until the nasty smell went away) and the static problems disappeared. Look in the laundry section of your grocery store. If you like carpet or other charge-generating surfaces on your workbench I'm convinced a weekly treatment of the surface will take care of any normal static problems you may encounter.

A few drops of non-automatic dishwasher detergent (like Joy or Dawn) in water in a spray bottle also works to hold static down. I have not compared it with StaticGuard but would not be too surprised if it worked as well, although detergent build-up might occur. StaticGuard seems to leave no trace.

—DE AC7ZN

From Lew Pacely, K7GO—

I paid less than $15 for the last antistatic mat I bought on Amazon.com. The grounding wrist band was around $8. Humidity is generally low here in southwest Montana and static electric discharges can be especially troublesome in the winter. In other areas and climates the danger of static damage may be less of an issue.

My makeshift solution before I purchased my anti-static mat was to cover the table top with heavy duty aluminum foil and ground the foil through a 1 megohm resistor. This works OK too if you don't mind replacing the foil once in awhile after the inevitable tears due to tools and equipment. The XYL thought it looked like... umm... looked unprofessional.

—DE K7GO

Grommet Strips for Making Loading Coils

Remember the old air wound Miniductor and Airdux coils? Actually, they are still around and available (but definitely not cheap). The web site is

www.bwantennas.com/coils/coilcat.htm

Hams haven't used the smaller ones much for a few decades, but the larger ones are often used for antenna loading coils and in antenna tuners. Since they can be pretty pricey, homebrew versions of it have been around for quite some time and some of those use plastic grommet strips to hold the turns in place.

Since that technique has been described in several places over the years I was just going to supply a bit of additional information about the strip material itself from a discussion on the homebrew forum on eham.net. But one of the posters, Phil Salas, AD5X, mentioned that he had a construction article about it on his web page; I looked at it and immediately asked him if I could use some of his photos to illustrate the basic ideas.

You can find the full article with all details (including a support frame for use as a mobile antenna loading coil) online at this direct link:

www.ad5x.com/images/Articles/
CoilRevB.pdf

He also has quite a few other interesting articles. Go to the home page at www.ad5x.com and click on Articles.

Figure 21 shows the basic ingredients to make a coil. In addition to 14 gauge tinned copper wire, it uses a piece of 2" OD PVC pipe (which will be discarded later), several pieces of grommet strip and some cable ties.

As shown in Figure 22, 4 pieces of grommet strip are clamped to the pipe with cable ties. A couple of rows of teeth at both ends of each strip are cut away to provide clearance for the ties, as seen in the lower right. (One of the strips on the pipe is difficult to see here due to the lighting.)

The coil is wound as shown in Figure

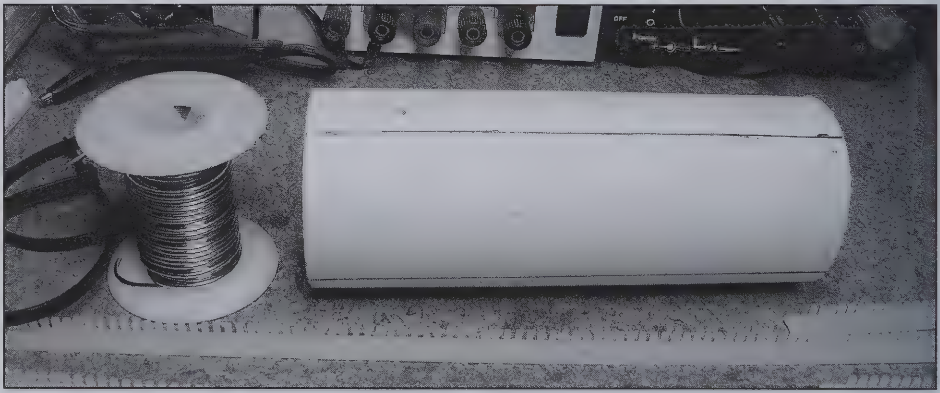


Figure 21—Basic ingredients for the coil are wire, PVC pipe and grommet strips.

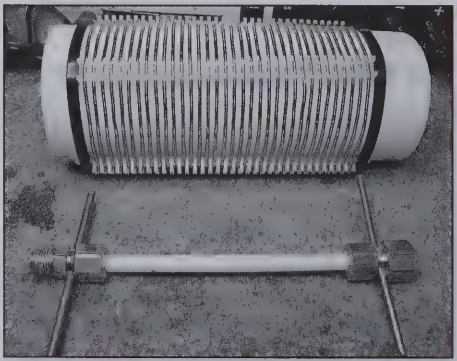


Figure 23—Wind the coil, using the grommet strips to hold it.

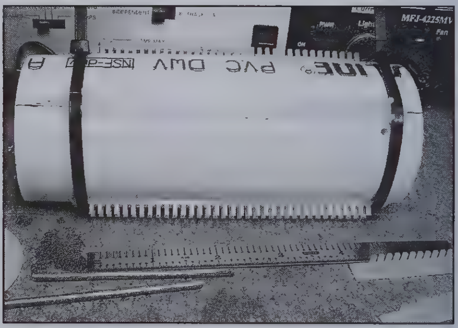


Figure 22—Four grommet strips are secured to the pipe, spaced 90 degrees apart.

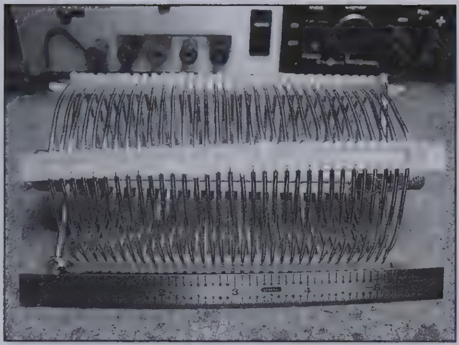


Figure 24--Fill the strips with hot melt or epoxy glue. After hardening, remove the PVC pipe.

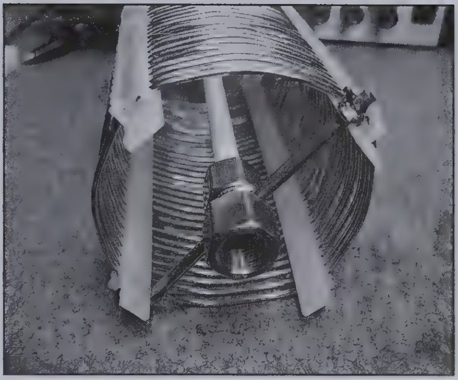


Figure 25—End view of the coil, with the support soldered to the end turns.

23. The contraption in front is a coil support made from some brass rod and fittings plus a piece of fiberglass rod; details are on his web page. Next, the centers of the grommet strips are filled with hot melt glue or epoxy to hold the wire in place. After hardening, the cable ties are cut off and the PVC pipe is removed, leaving the coil as shown in Figure 24. The coil support, if used, is added after the pipe is removed; it's in the center of the coil, soldered to the end turns. Figure 25 is the view looking into one end. (Again, you can find full details on the AD5X web site.)

The grommet strips are also known as caterpillar strips, or edge trim. They are available from McMaster Carr (www.mcmaster.com), a well known industrial supply house. They have no minimum order and I've made many small orders from home. Their stock number for this particular nylon edge trim is 85085K8. It's sold in packages of 25 foot long pieces for about $12, enough to make a number of coils.

This particular strip gives a coil of 8 turns per inch due to the spacing between the teeth. McMaster has several different versions available. KC6ZZT asked how to determine how many teeth per inch there are since the product descriptions don't give that; he was wondering if it would be possible to get one that would give him 6 turns per inch instead of 8.

N3OX pointed out that the number of teeth per inch is not part of the specification and really isn't an important parameter, considering the use of this product. It's purpose is to fit over the edge of a panel or sheet of metal to provide protection against sharp edges. The important dimensions are the gap between the two rows of teeth (how thick a panel it will fit) and the length of the teeth. The number of teeth per inch is immaterial.

KC6ZZT later called McMaster; someone went into the warehouse and checked, and told him that all of the nylon strips of this type in the catalog are 8 teeth per inch.

They also told him that they get them from Thomas & Betts, their part numbers GSNY-052-9-C, GSNY-085-9-C, GSNY-128-9-C, and GSNY-192-9-C. (You can find them on their web page, www.tnb.com, by entering GSNY into the search block.) Thomas & Betts sells them in packages of 100 (and McMaster by packages of 25).

By the way, cable ties are often called "tie-wraps" since Ty-Rap is a well known brand name of them. Thomas & Betts owns the name.

My thanks to AD5X for supplying high resolution photos.

Genuine HW-8 VFO Capacitors Available

It is not unusual for the plates of the HW-8 VFO capacitor to become damaged or even to fall off the rotor. (The dial drive is capable of providing a lot more torque than the capacitor can withstand without damage.) It was sometimes possible to successfully repair them, but finding replacement capacitors was next to impossible.

Then, back in 2003 I ran an item from Larry Baker, WB5OFD, announcing that he had found the company that made the original capacitors for Heath, and they were still in business. The company is in Ohio and currently known as Oren Elliot Products and their web site is at http://www.orenelliottproducts.com. They had a few in stock and could make more on request.

You can still order the part from them, but now you can also find them on eBay, from seller "datapro." That's Don Peterson, a former Heath employee long ago; his web page is www.d8apro.com. He posted this recently to the Heathkit forum on yahoo.com—

"I have some of these available on eBay; part number 26-152. They are new parts manufactured by the same company that made the originals for Heathkit. I got a deal from them by buying much larger lots at a time, then making them available to the general public in single lots. Do a search on eBay for 'Heathkit HW-8' and you'll find them. I haven't had the time to add them to my shopping cart on my web site, but I'll be doing that soon."

[As Don notes on eBay, these are not "new-old-stock" or pulls from used rigs; these are newly manufactured.]

Caution on Crystal Oscillator Can Transmitters

Much of this, minus the figures, originally appeared in an online post to the QRP-L mail reflector, with the subject line "Unfiltered crystal oscillator cans are very dirty":

Some computer style oscillator cans have output frequencies in ham bands, and using them as QRP transmitters has been going on for a couple of decades or more. There have been occasional articles about it in various places, and some eBay auctions for them even tout them as QRP transmitters. Perhaps the most well known article about this was the Fireball transmitter in the November 1990 issue of *73* magazine.

You can expect on the order of 10 to 40 milliwatts output into a 50 ohm load. (Note that these units are not designed to operate into a load that low, and that 50 ohms is loading them down heavily.) However, you do need to keep in mind that they fail to meet FCC spectral purity requirements by a spectacular margin unless used with some type of output filtering. They are, after all, square wave outputs, something that is rich in harmonics. (And if you look at one on an oscilloscope when loaded down with 50 ohms, the waveform isn't a very pretty square wave, either.)

I've played around with these a number of times over the years, using 50 ohm loads, and the results are basically always

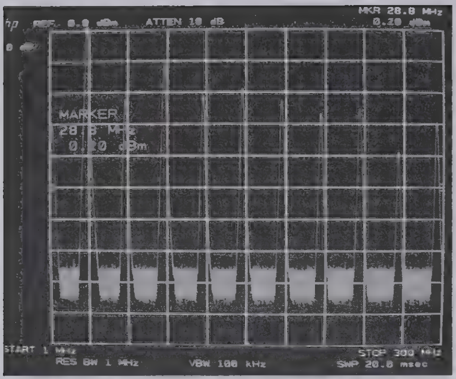


Figure 26—Unfiltered output of a 28+ MHz crystal oscillator can into a 50 ohm load.

the same. The strongest harmonics are typically down from 10 to 13 dB below the fundamental, and I've seen a few where some harmonics were less than 10 dB down. (For comparison, the FCC requirement is 43 dB.) Figure 26 is the output of one feeding a 50 ohm load by way of a 0.01 uF capacitor serving as a DC block. When fed through a simple 5 element filter the output is much cleaner, as seen in Figure 27. (The vertical scale in both cases is 10 dB per division.)

(A word of caution about feeding the output of one of these directly into a spectrum analyzer: Don't! *All spectrum analyzers have limits on the amount of power they can accept without damage, usually written near the input connector, and it's always a good idea to stay well below that. It's also never a bad idea to have a DC block at the input, which is basically just a capacitor. These photos were taken while passing the signal through an external attenuator into the analyzer input.)*

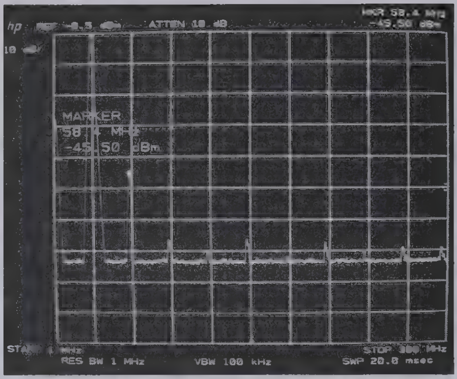


Figure 27—Output with the oscillator fed through a five element pi low pass filter.

If you will be using an oscillator can for a transmitter you really should consider having an output filter of some sort on it. Sooner or later, I expect someone to say, "the power is so low, who is going to hear the harmonics?" And my response will be: If an FCC van pulls up at your house in response to a complaint from a nearby authorized user of some frequency who has to put up with your harmonics, one of their first questions will be "where's an outlet I can plug my spectrum analyzer into?"

The NJQRP Club put out a kit of their enhanced version many years ago, called the Jersey Fireball 40, and it had provisions for a low pass filter. (Although the kit was discontinued some time ago, information is still available on their web site at www.njqrp.org. Look under the "Retired Projects" section.)

And if the harmonics aren't enough to worry about, here's something even better that I stumbled on a couple of years ago. This applies only to the inexpensive plastic cased oscillators, such as those made by Epson, shown in a socket on my test fixture in Figure 28, and only those which are actually overtone oscillators rather than fundamental.

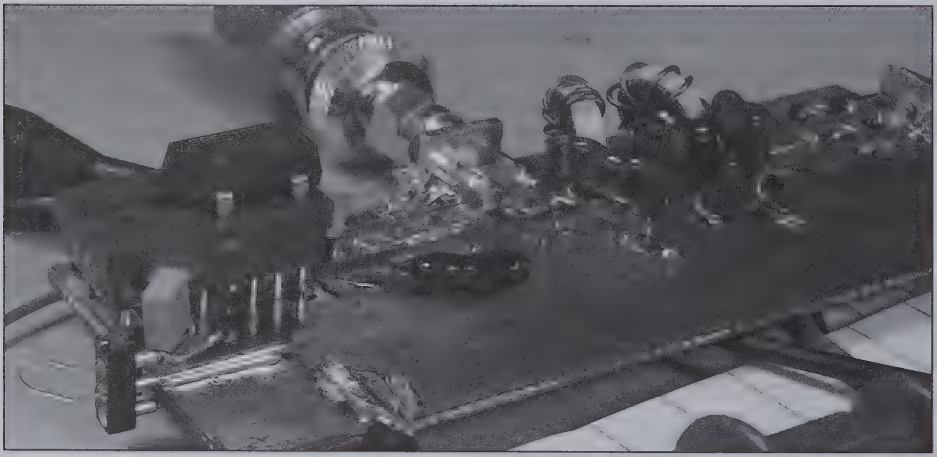


Figure 28—Without a power bypass capacitor right at the package, this style of oscillator can drop from overtone into fundamental mode if operated with a 50 ohm load.

Under certain circumstances, which might be encountered when using one as a QRP transmitter, they may operate at about 1/3 of the marked frequency, and that low pass filter won't do a bit of good for that. (The unit shown is the half size DIP although they are also available in full size.)

The oscillator output is fed through a DC blocking capacitor, partially visible to the right of the socket. Depending on where a jumper is soldered, the output either goes to a connector, for an external load or attenuator that goes into a spectrum analyzer, or is passed into a 5 element low pass filter designed for 10M use. (In this photo, the edge mount SMA connector has an SMA to BNC adapter and 50 ohm Ethernet BNC terminator connected to it.)

The wires from the power supply to the test setup were a few feet long and initially there was no bypass capacitor on the power pin of the socket; that turned out to be the key. (The power bypass capacitor in front of the socket was added later along with a few contacts cut out of an old IC socket; it can be switched in and out with a wire jumper.) The frequencies of the oscillators I saw this on were all over 25 MHz, where they were actually overtone crystals, not fundamental type. It happens with the 28+ MHz ones but not 3.684 MHz, for example.

(I didn't have a very large sample of frequencies so I couldn't get an idea of the point where the manufacturer goes from fundamental to overtone crystals. Although oscillators of this type are often quite inexpensive on eBay, it quickly gets expensive when buying a lot.)

If there was a bypass capacitor connected from the oscillator power pin directly to ground there was no problem. It would oscillate in overtone mode, at the frequency marked on it, even loaded down by 50 ohms. However, if there was not a capacitor right there—and the output was loaded with 50 ohms—when power was connected they would oscillate at the fundamental frequency, which was approximately 1/3 of the marked output. Think of what might happen if it was being used as a transmitter. Sure, there would be some output at the marked frequency of 28.322 MHz, but it wasn't as strong as the 9.47 MHz fundamental.

Figure 29 shows the output of one in this mode. It would look like Figure 26 or 27 (depending on whether there is a filter on the output) if it was operating normally. Even if it was followed with a filter for the intended frequency, a lot of undesired energy would be transmitted. (The sweep in all 3 cases is from 1 to 300 MHz; the horizontal scale is the same for all, about 30 MHz per division.)

Figures 30 and 31 show the output of the oscillator connected to an oscilloscope, unloaded and with the 50 ohm load. In both cases there is no power supply bypass capacitor connected right at the package. If there was, both would show a 28 MHz signal. (The time per horizontal division setting is the same in both cases.)

Keep in mind that these plastic ones perform quite well when used as intended, which is with a light load on the output (and properly bypassed). It's just that they are not designed to work into 50 ohms, which puts a heavy load on them and results in abnormal operation. I saw a note in the data sheet for the family that advised putting a bypass of greater than 0.1 uF as close as possible to the device to insure stable operation. (And that was when being used as intended, with a light output load.) A 0.1 uF cap seemed to work fine for me, though.

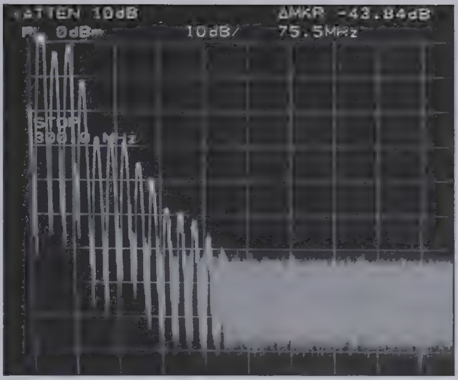


Figure 29—Marked as 28.322 MHz, this oscillator is running at the fundamental around 9.4 MHz. (The frequency span is the same as in Figures 26 and 27.)

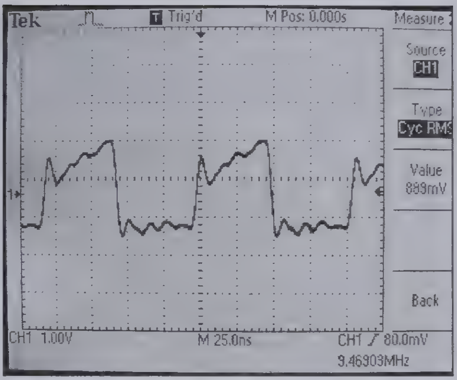


Figure 30—Oscilloscope trace of the Epson oscillator output waveform with no load.

I've opened up a number of metal oscillator cans over the years and they always have components in addition to the semiconductor oscillator die and crystal. Figure 32 shows a half size can with and without the quartz element, and Figure 33 is a full size can with the quartz removed. Some full size cans have a bare die with exposed bond wires like the one in Figure 32. One of the surface mount capacitors in each is a power supply bypass; the manufacturers weren't taking any chances. (Another full size can that I removed the lid from did not have any visible capacitors although it did have printed resistors.)

The plastic ones are not easily dissected, being potted in solid material, but some X-rays show that they had the oscillator die and crystal and nothing else; there were certainly no bypass capacitors. Any additional components would be easily visible. (With the metal cans the crystal is bare quartz but in the plastic ones they are in miniature cylindrical packages.)

The bottom line is that if you plan to use a computer clock oscillator can as a QRP transmitter you need to be aware that the unfiltered output has high harmonic content, and you should include a bypass capacitor on the power line right at the package to be safe. (The latter is pretty much a standard design feature in electronics anyhow.)

PS—Actually, the rules about spurious outputs are a bit more complicated than a one-size-fits-all value of 43 dB, depending on when the transmitter was built, power level, etc, but you can never go wrong using that number. (That's for something below 30 MHz. Go above that frequency and it gets more stringent.)

—DE WA8MCQ

The Fine Print

You know the drill. Snail mail address is on page 3, and the e-mail address is also at the top of the column. I accept floppies, CDs, typed paper, handwritten notes, etc. Don't worry too much if a submission isn't polished or doesn't include a computer schematic file since I edit and do computer drafting as needed. The main thing is to get your inputs to Severn.

●●

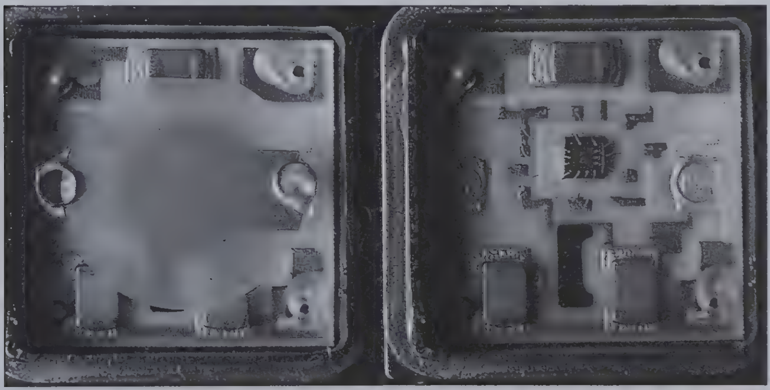


Figure 32—Inside a typical half size oscillator can, with and without the quartz.

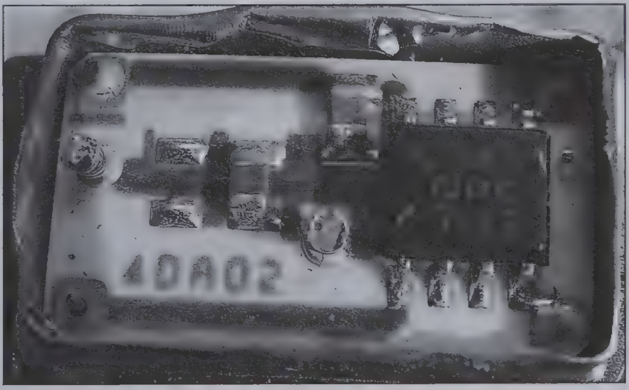
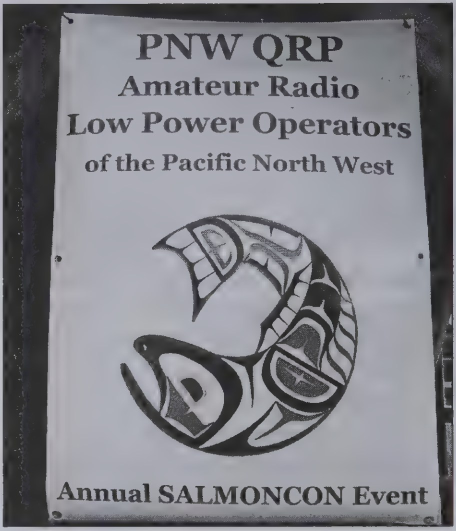


Figure 33—Inside a typical full size oscillator can, without the quartz.

QRP Clubhouse

Timothy Stabler—WB9NLZ wb9nlz@yahoo.com

Hello again. As you may have seen earlier in this issue, I will be the new Editor, starting with the Winter 2012 issue. This definitely will be a new challenge for me. However, for the time being, I am not giving up this column. I really enjoy doing this column; although I have to admit there are times have to I work to get club information. For some reason, clubs do not seem to want "free advertising" they get from getting information in here. Anyhow, if you do have any club information you want to share with others, please get it to me. Also, with my new post, I am looking for articles on your construction projects, antennas or whatever.



Salmoncon

The Pacific Northwest QRP Interest Group (pQRP) is simply a group of like-minded Hams that regularly communicates through PQRP@yahoogroups.com, meets once a month for P&C (pie and coffee) on the last Wednesday of the month at the Crystal Creek Cafe in Bothell, Washington, at 7 PM, and hosts the Salmoncon event the weekend after 4th of July each year. Salmoncon will be over the weekend of 13-14 July in 2012. Salmoncon is held at Valley Camp (valleycamp.org), about 30 miles east of Seattle just south of I-5.

I received this Salmoncon wrap-up from Wayne McFee, NB6M, liked the way it was written, so have enclosed it here minus a personal comment or two.

"As has been the case thus far, Salmoncon VI again demonstrated the most important aspects of our outings, such as the spirit of extending a warm welcome to everyone, the sharing of common interests, and the low-key, laid back approach that we always take to these events.

We all want to warmly thank Thom and Teena, our hosts, for their hospitality and for their personal participation in the event. Thom and Teena, you guys are great, and are definitely part of the PNW QRP family.

A very special thank you goes to Dean, N7XG, and Jan Davis, who came up from Salem, Oregon, bringing lots of those very nice pQRP nametags and lots of energetic can-do help in the day to day running of the event. We are very glad you came up to join us, and are looking forward to seeing you again next year.

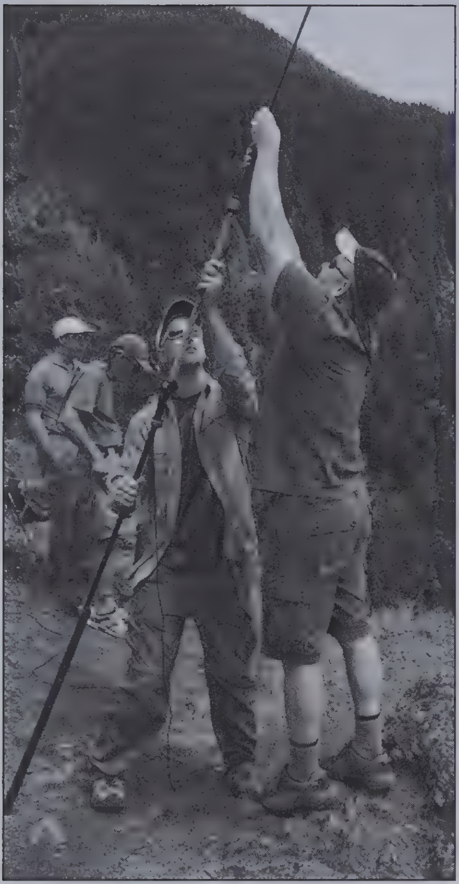
Doug, W7RDP, was again instrumental in securing our special event station callsign, K7S, which we proudly put out on several of the HF, VHF and UHF bands. Doug will be compiling our master contact log, so if you have contacts that haven't yet been turned in to him, please do so direct, at: W7RDP@msn.com

For info, we had forty-four people sign our attendance log, which was up quite a bit from last year's thirty-three. And, I know that there were a few who didn't sign in, so the actual number was even higher than that. Given the word-of-mouth and other advertising our event is getting, I expect that number to be larger yet next year. We learned a few things, prompted by the larger numbers attending, that we will incorporate into next year's event. Which, by the way, will be again held at Valley Camp.

We will set a start time for the Saturday and Sunday breakfasts, at 8:00 AM. We will also bring enough BBQ briquettes to cook both the Saturday evening Salmon Burgers and the Sunday Evening steaks on the large barbecue, helping ensure that more people can eat sooner.

We will also change the time of the first presentation on both Saturday and Sunday to 10:30 AM instead of eleven, so as to provide a half hour of prep time for the lunches on those two days.

I thoroughly enjoyed the entire event, and especially enjoyed getting my hands on the prototype KX3 (may have to actually buy one of those, hi hi). Thank you Lyle and Rich, both for your work on that project and for having units at Salmoncon to try out.



We had a full slate of presentations this year, and we are working towards putting all the slide-shows and other documentation in the files section in pQRP on yahoo groups.

The Little Si expedition was a great success, with nine people actually climbing to the summit to activate it.

Sandy and I stopped off at Rasar State Park on the way home, then spent most of the next day checking out the Baker Lake area, so I'm just now getting around to writing up a Salmoncon wrap-up.

As has been the case thus far, Salmoncon VI again demonstrated the most important aspects of our outings, such as the spirit of extending a warm welcome to everyone, the sharing of common interests, and the low-key, laid back approach that we always take to these events.

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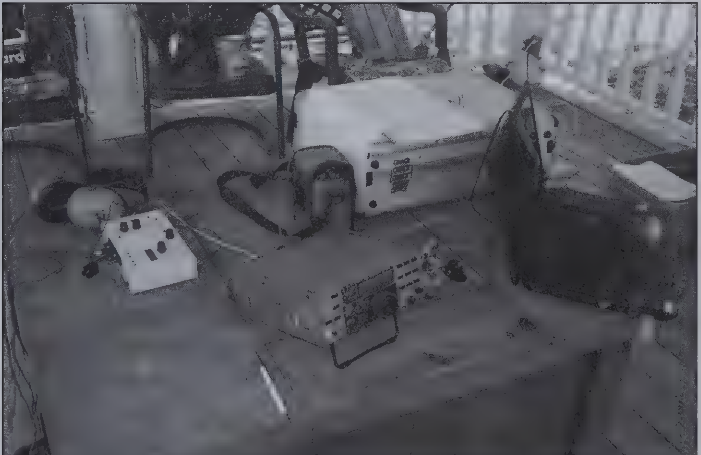
Thanks to Charles Knutila, N7KN and Eldon Brown, WAØUWH, for their photos.

Midwest Homebrewers and QRP Group

The HBQRP group meeting scheduled for the second Saturday in September will be a "British Build Session." They have ordered a number of the G-QRP limerick sudden receivers and a matching number of the G-QRP limerick Transmitters. Best guess is that it will take one Saturday to build one and then at the November get together they will finish the other. Several of the group plan to also build the 4State QRP groups little magic box. (this is an all solid state fully functioning microprocessor based T/R switch—see www.wa0itp.com/mbmagicbox.html). This is the website for Terry Fletcher, WAØITP, and if you go to it, you will see a listing of the kits the 4SQRP Group has available.



As always, every get together is "show and tell" day and everyone will bring their newest and neatest toys.

November will be the 7th anniversary for the group. The group's motto is "Hey, this is supposed to be a HOBBY and it is supposed to be fun!" Feel free to drop in on the second Saturday of any month and share a good time, eat some Pizza and become a part of their QRP family.

While in CT this past July, Dar Piatt, W9HZC, took a day to run up to Cornell University and visit their Aerospace graduate study group. They are experimenting with a tiny satellite measuring about 1-1/2" by 1-1/2" square. It has 7 tiny solar panels on it for powering the tiny microprocessor and a tiny transmitter (on 902MHz) and of course an equally tiny antenna. They refer to is as a "Chip-Sat." In their lab was also one of the Cube-Sats. Busy folks these students. There are current a couple (or 3) of the Chip-Stats stuck on the side of the ISS (International Space Station) and when the sun strikes them, they turn and send data bursts out.

Dar wanted to volunteer to gather a group of Ham's to listen on 902 MHz and record the data bursts and pass the information back to Cornell. As soon as he gets all the details worked out, he will be looking for hams all around the globe to help listen and record. Kind of like recording the NOAA WX satellite and then playing it back on the PC to see the weather map. The graduate students working on this project would like to see Chip-Sats on some of the different space probes scheduled to be launched in the next few years and be able to collect data for NASA. Receiving 902 MHz from the orbit around Earth should be fairly easy, receiving 902 MHz from Saturn or other far out places sounds like a challenge. All hams like challenges.

If you are interested in assisting and listening, you may email Darwin at W9HZC@Cox.net for now. He will be getting an e-mail address for Chip-Sat e-mail only up in a week or so. Just put Chip-Sat in the subject line. If you are interested in learning more, try these URLs:

http://www.centauri-dreams.org/?p=17750 and

http://www.csmonitor.com/Science/2011/0429/Cracker-size-satellites-to-launch-with-Space-Shuttle-Endeavour

Great Outdoors Radio Club

The Great Outdoors Radio Club (GORC) is really not a QRP group but most of the members do operate QRP. There is a group of them, the Renegades, who operate Field Day QRP. An article about their Field Day activities is in this issue. If you want email from them, go to Yahoogroups.

North Georgia QRP Club

Norm Schklar, WA4ZXV, sent me this article about a group within the Northern Georgia QRP Club. Again I liked it "as is" so am putting it here as it was sent to me.

"Another episode of Life with low power Amateur Radio, QRP. The last Sunday in July is FOBB. Flight of the Bumble Bees. This contest is put on by the Adventure Radio Society http://adventure-radio.org/wiki/index.php?title=Flight_of_the_Bumblebees. It's a 4 hour contest where each station is assigned a Bee Number and the Bees try to contact each other. This year there were 244 Bees. These are scattered all over the US, Canada and a few global stations. Needless to say the Bee part is the low level signal generated by the low power cw signals. In Gwinnett County, GA a small group (AD4S, N4EWT, WA4ZXV) operated out of Dacula. We put up two W3EDP antennas. One end of an 88 ft wire connected to the radio and the other end up almost vertical in tall trees. A 17 ft counterpoise is added to the ground side. One station was under a gazebo and the other in a travel trailer. We operated Bee #1 as N4EWT and #63 as NQ4RP one of the NoGaQRP club calls.

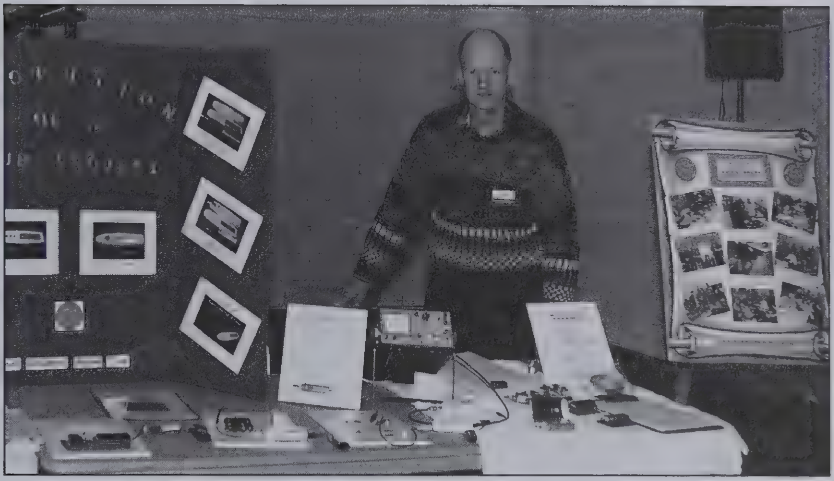
For those of you that vision FOBB as a ham radio outing like a full-fledged Field Day, believe me it doesn't have to be that extravagant. We had two small radios, 2 tables, 2 very light antennas, 2 small batteries, chairs and wasp spray (Picture 11). We used a foot pump and a pneumatic launcher to get string and wire up in the trees. The wire was 22 or 24 gauge. No coax. For peripherals we had two coolers.

Sure we had spares of most everything, but we really didn't need them.

At 1:00 local we started the contest. I worked three or four contacts on 20 meters then handed it over to Pickett, AD4S who added a few. At the halfway point, we changed bands with Newt, N4EWT (40). At that point we were working 40 meters and it was slow picking. We cranked down the power to work Newt just across the lot, and forgot to turn it back up. So we worked the last hour or so with half a watt or maybe less. Just after 4:30 the sky clouded up and the lightning started. We disconnected from the antennas and waited out the rain. Rain stopped by 5:00 and we congratulated ourselves for about 30 minutes then pulled the wires down, loaded the cars and went home.

Visit http://qrparci.org for a list of more QRP events. And now, the ARRL has a forum on QRP contesting. Visit

PARC Spring 2011 Buildathon project . (Photo: VE3FAO)



Frank Roberts VE3FAO and the Ham-EX™ display. (Photo: VE3VDK).

http://arrl.org and select forums from the sub menu. You'll find one on QRP Contesting.

Not a bad day in the WA4ZXV Amateur Radio World!"

PCRC Homebrew Group:

It seems that Buildathons are becoming more and more popular and theirs is no exception. Last fall the Peel Amateur Radio Club's Buildathon attracted 20 hams. That was an increase over the number attending in the spring of that year. Then, this spring they held their 18th semi-annual event and registered over 30 builders. The project this time was a micro controller based SWR/PWR meter with an LCD display that we named the So-WATT. As usual the Buildathon was an all day activity and most of the units were completed and tested by the end of the day.

The Mississauga ARC and the Peel ARC team up to sponsor one of Canada's largest hamfests known as Ham-EX™. The PARC Homebrew Group developed a hands-on display that encouraged more than a dozen new members to join our club.

The hands-on Buildathon display at Ham-EX™ earlier in the year contributed to the increase in participation at their Buildathon. (http://www.ham-ex.ca/)

Lastly, Ken Hopper, N9VV, sent me SDR information he wanted me to get out to give clubs ideas for buildathons, activities, etc. He has included three of his websites, his normal site plus two subsites (or whatever they are) on kits and projects. They are: http://www.n9vv.com; http://www.n9vv.com/collected-list-QSD-kits.html and http://www.n9vv.com/interesting-SDR-software-projects.html

James Ahlstrom, N2ADR, had an article in the Jan/Feb issue of *QEX* on a new project on SDR. It is being kitted by Helmut Goebkes DB1CC: http://hiqsdr.finken-net.de/ and http://www.technologie2000.de/page5.php (in German)

The OpenHPSDR.org Hermes Project is found at: http://openhpsdr.org/wiki/index.php?title=HERMES

Wrap-Up

Thank you to everyone who sent in information. A month ago, I had nothing. So please send me your club information on activities, or whatever you are doing. If you have something longer of interest on some activity, send it to me as an article. In either case, can you send photos as JPEGs? They are easier for me to handle.

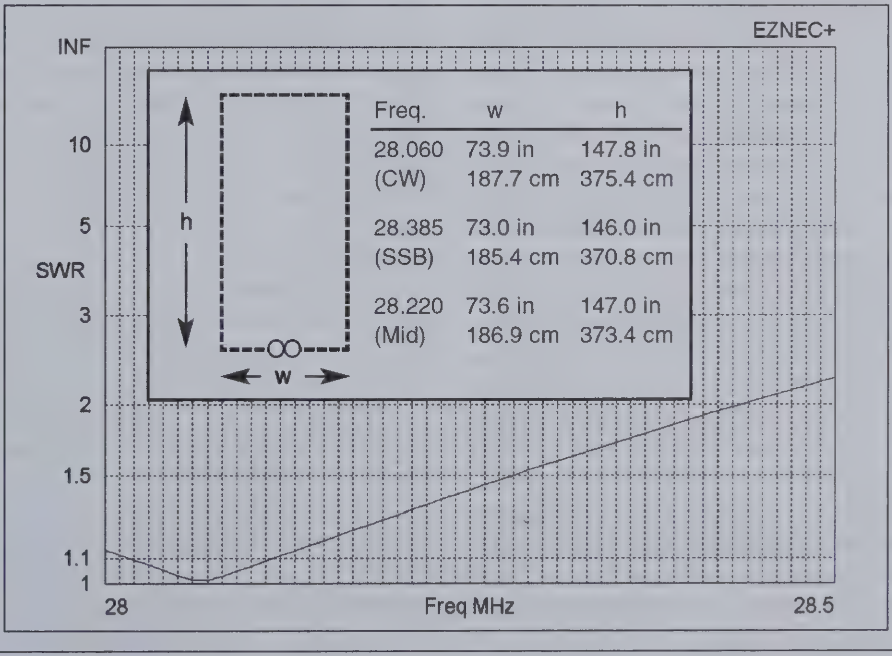
—72, Tim

●●

Correction to Summer 2011's "Antennas 101" Article

Oops! I entered data into the wrong columns in the English/metric units conversion program and got some wrong numbers in Figure 4, on page 41. The correct data is inlcuded below. Sorry for the mixup—which was pointed out by several readers, (mostly from "across the pond").

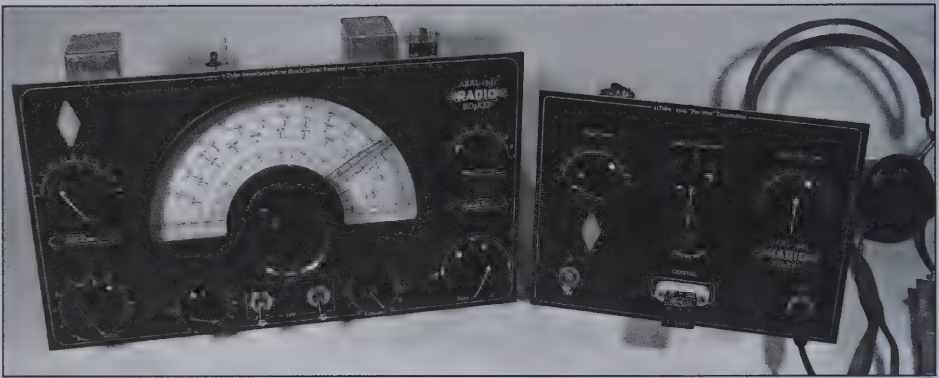
—73, Gary Breed, K9AY



Freq.	w	h
28.060 (CW)	73.9 in 187.7 cm	147.8 in 375.4 cm
28.385 (SSB)	73.0 in 185.4 cm	146.0 in 370.8 cm
28.220 (Mid)	73.6 in 186.9 cm	147.0 in 373.4 cm

QRP, 1941 Style

Tom "Nick" Nickel—KC9KEP
bignick@execpc.com



If any of you have happened to visit my website, http://www.bignick.net/Morgan_Radio/Radio.htm, you know that I have a real fondness for "hollow state" radio gear from the 1940s. I'm not sure just how I came by that addiction, but I am definitely hooked. My latest "binge" happened when I came across a 1941 ARRL *Handbook*. It was chock full of really neat old receivers just dying to be built. So, I started with enthusiasm and so far have completed several of the receivers and a transmitter.

The most ambitious of my 1941 receivers is a seven tube superhetrodyne, touted as being capable of "single signal reception." The first version of the receiver appeared in the October 1938 issue of *QST* magazine, followed by a "modernized" version in the November 1940 issue. Both articles were written by George Grammer, W1DF, a famous *QST* author of yesteryear with many articles to his credit. The receiver was then published repeatedly for several years in the ARRL *Handbook* issues starting in 1941. This new "modernized" version featured the following upgrades over its predecessor: increase in gain (fivefold), lessened interaction between controls, higher order of stability, calibrated dial with direct frequency readout, AGC, volume control, and internal voltage regulation. According to the author, the cost to build in 1941 was about $30. This translates to roughly $460 in 2011 dollars, still not a bad price for a Class A receiver.

Truth be known, I did not give the article title: "Single Signal Receiver" much attention in terms of what the title is telling the reader. My assumption was that a single-signal-receiver must be a good receiver with good selectivity—which is true. But, Single-Signal-Receiver means much more than a "good" receiver. It indicates a filtering system that features selectivity so narrow that it virtually eliminates audio-frequency image response in CW reception. The usual receiver of the day was not capable of eliminating this audio image and so was vulnerable to more interference. Another advantage of single-signal reception is that the background noise is greatly reduced because a narrower part of the RF spectrum is being detected and amplified. So, how can this be accomplished? Insert a DSP and use digital filtering? Not in 1941! A crystal filter could be inserted into the IF strip with similar results, but there is a much cheaper method for accomplishing this improvement. The IF amplifier can be made regenerative in order to greatly boost the IF signal at resonance and narrow its bandwidth by the simple addition of one feedback component. Some of you who have been hams for a while may remember the "Q Multipliers" of the 1950s and 1960s. Well, this receiver employs exactly the same principle. The difference is remarkable.

In this article, I'll share some of my experiences and construction practices used in building this receiver and a companion 1941 QRP transmitter. However, the article is not intended as a step-by-step construction description. For that, you will need to consult the original articles. If you do decide to attempt a similar project, please remember that tube equipment contains some potentially deadly voltages and requires some safety equipment for heavy duty cutting and drilling

Receiver Overview

Figure 1 shows the front panel of my receiver and Figure 2 shows a top view. Notice that the power supply is separate from the receiver itself, connecting via an octal plug on the rear. The front panel and chassis are both made from 0.090" sheet aluminum. The U-shaped chassis is 7" x 11" x 2" and the front panel is 7" x 12". The front panel is identical to the original design, with two exceptions. The original had the AGC and B+ switches attached to the dial face. I couldn't bring myself to drill holes in the antique National ACN dial face so I placed those switches on the front panel. The receiver chassis is also quite similar to the original version. Luckily, the article describing the receiver had a photo looking almost directly down on the chassis. So, I made a full size copy of the photo and attached it to the chassis as a template. I did make a few trivial changes from the ARRL layout. I mounted a speaker output transformer under the chassis. By moving the gas regulator tube a bit inboard, I was able to fit a 3" x 5" speaker right on to the chassis. Note that ham radios are generally not designed this way because the speaker can transfer acoustic vibration to the radio chassis. If you are unfortunate enough to have used a microphonic 6F6 output tube, you can wind up with acoustic feedback in the output section. But, this method worked fine for me.

Those of you who are only familiar with current day equipment may be wondering about the function of some of the front panel controls. RF Tune is used to peak the front end of the receiver, a common technique of the day. Band Set is a kind of coarse frequency control that placed the HF oscillator in its proper frequency range for each band. Because the Band Set control affects receiver calibration, careful resetting of this control is required. I made resetting easier by printing RF Tune and Band Set settings for each band on the dial face. The best approach would be to have a 100 kHz crystal oscillator as an accessory. Ham stations of the day often used these oscillators as a reference since harmonics of the oscillator signal fall on the edges of all ham bands in use then. With the reference oscillator on and main

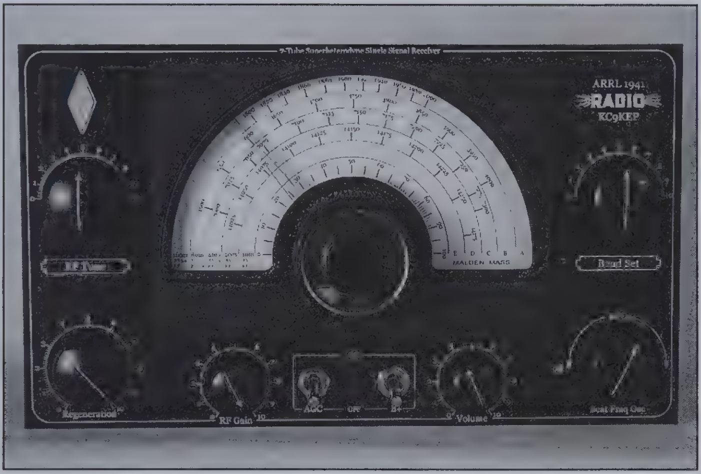


Figure 1—Front of the 1941 Superhet

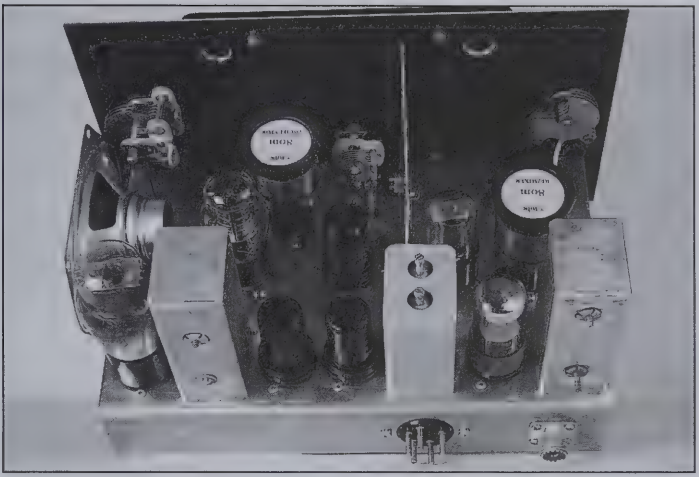


Figure 2—A Top View from the rear.

dial tuned to a band edge, it would only be necessary to change the Band Set slightly until the reference signal could be heard. Finally, the Regeneration control provides positive feedback in the mixer stage. Those of you who have tried regenerative receivers know that large changes in frequency usually require adjustment of this control to achieve the proper amount of such feedback. In this case, we want just enough feedback to increase gain without causing self oscillation in the mixer. Some of you may be wondering where the band switch is on this receiver. There isn't one. Rather, band switching requires changing two plug-in coils, one for the mixer and a second in the HF oscillator. You can see them in Figure 2.

The receiver schematic, which shows several other features of the receiver, is shown in Figure 3. Note that there is no RF amplifier ahead of the 6SA7 mixer. The regeneration gain in the mixer probably made a separate amplifier unnecessary. Regeneration also had the effect of sharpening the front end selectivity to some degree, which would have been useful since L1 and L2 provided the only selectivity present in the receiver front end. Also, the most popular ham bands at that time were 160, 80 and 40 meters where external noise made an RF amplifier less necessary. Many hams used crystal-controlled receiving converters with preamplifiers for the higher bands, making their receiver into a tunable IF/detector. The variable local oscillator was then able to operate at lower frequencies, making stability much easier. The converter also improved image response in the higher bands because of the double frequency conversion. The schematic also gives you a better idea of the band switching mechanism. L1, L2 and L3 are all wound on the coil form labeled Mixer in Figure 2. Similarly, L4 and L5 are wound on the Oscillator coil form. The single signal selectivity is provided by further regeneration in the 6SK7 IF Amplifier. Because this circuit operates at a fixed frequency, the amount of regeneration does not need to be changed continuously. Rather, it is set when the IF is tuned up and is not changed unless the operator decides to change bandwidth for some reason. Operators who only used the receiver for CW probably never changed it at all. Operators interested in both CW and Phone operation would probably have to have two settings for the different bandwidths involved, and most likely one of the two settings would be a bit suboptimal. Finally, notice that the 6C5 BFO is tunable, unlike most present day receivers. The low IF made tunability with stability possible and operators used it as a signal separation tool. Tunability also provided a clever way to turn the BFO on and off. I just bent the corner of one rotor plate on the BFO tuning capacitor. Then, tuning the BFO so that the capacitor was fully meshed grounded the stator plates and stopped the oscillator. You may also notice that the schematic required a small capacitor connecting the BFO to the 6SQ7 diode plates. In my case, I just inserted a wire from the BFO into the IF transformer and stray capacitance did the rest.

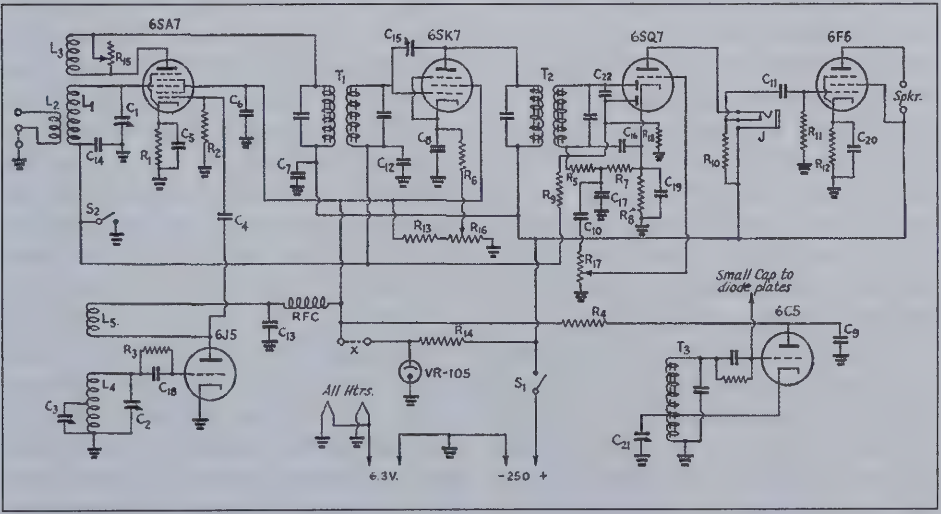


Figure 3—Receiver schematic (with kind permission of ARRL).

Construction Notes

Building a pseudo-antique radio is not altogether the same experience as building a piece of modern equipment. Let's talk about some of the differences.

The first problem is finding the parts.

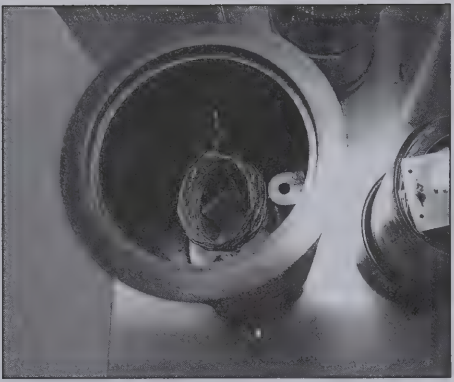


Figure 4—Inside a band change coil.

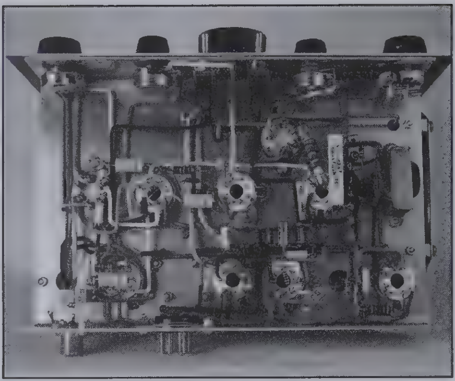


Figure 5—Bottom view of the wired chassis.

securely in place. The band change coils also contain "tickler coils" that are tuned by rotating the tickler coil with respect to the coil form axis. The tickler coils are "scramble-wound" upon a 1/2" wooden cylinder that is diagonally cut so that it can be removed after a coil is wound. Before using the cylinder, I placed one wrap of waxed paper around it. After the coil is wound but still on the arbor, I apply a coat of Duco cement to the coil in order to hold the windings in place. The waxed paper keeps the cement from adhering to the coil arbor when removing the coil from the arbor. I used a heavy gauge wire to support the tickler coils inside the plug-in coil forms. To attach the tickler to the large gauge wire, I flipped a coil form upside down and inserted the heavy wire into a pair of the empty coil pins. This provides the proper spacing for the support wire and a handy holder for your work. Figure 4 is the end result, showing how the tickler coil is mounted inside of the coil form.

There are some companies on the web that cater to people who are trying to restore old radios. I was very lucky to find two of the required vintage IF transformers from www.oldradioparts.com and the third one from eBay. eBay frequently features old radio parts, but often times at a premium price. Radio Daze (www.radiodaze.com) is also useful. I bought a "kit" of single-strand hook-up wire with cloth covers in several colors from this firm. It can be nicely formed, stays where you place it and provides a nice vintage touch. It's also handy to use for coding circuit functionality: green for filaments, black for ground, red for B+, etc. Finally, for tubes and other parts there is Antique Electronics Supply (www.tubesandmore.com). Hamfests are also a great source of parts, especially for tubes and sockets. Most tubes will likely be used but still test as being good. I have had good luck using them. Plug-in coil forms can be tough to find, so I am always on the lookout for them. If possible, find coil forms with different pin placements or numbers of pins. By using two different forms within a coil set, you can't plug a coil into the wrong spot. (This is "poka-yoke" engineering done back in 1941!) They will probably be used but you can unwind any old wire and reheat the solder in the pins to remove the wire completely. While the solder is still molten, blow through the opposite end of the coil form and solder will come flying out. This leaves the pin open for the new wires. Hot soap and water and an old toothbrush finishes the cleaning job. Other old plated components such as tuning capacitors, tube sockets and switches can be cleaned up nicely using Tarn-X from Walgreens. A word of caution, don't immerse components in Tarn-X longer than required to remove tarnish. The acid will eventually dissolve the component.

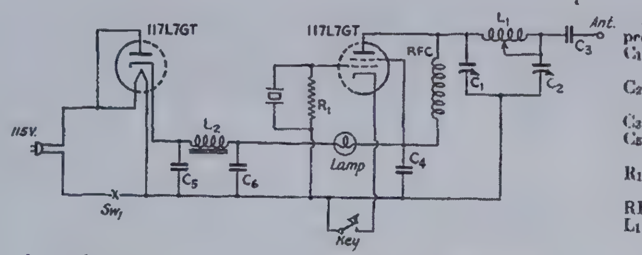
A second major difference is that the heavier, larger components are likely to require permanent mounting and that causes a bit more planning before wiring up the parts. For instance, a transistor might be supported by its wire leads but a tube requires making a hole in a chassis and mounting a tube socket. Before that hole is made, you need to make sure that the placement won't cause some awkward wiring of later components. When I need to wire a section of circuit that is complex (such as the AGC circuit) I'll take the time to draw it out several ways to see how I might best fit components before actually soldering and cutting wire leads. A technique that I used in this set was to layout the components by making a computer drawing of the various parts, but deliberately not including the wires. Then, I would print the computer layout, and use a pencil to draw in the wires and look for various ways to re-orient the components most efficiently. Another construction help is to label the tube sockets underneath the chassis in order to help you wire the set. I have goofed up by wiring to the wrong tube on other projects! Once you are sure of your layout, get out the Greenlee punches and make holes for the tube sockets. But the old adage certainly applies here - measure (and plan) twice, cut once.

The older components sometimes cause special wiring problems. A case in point is wiring of the band change coils. When the coils are correctly wound, I carefully even out the turns spacing if need be, and place four beads of Duco cement along the coil. Two applications will hold the windings

I'll make a final point about wiring in general. Keeping the wire at right angles makes a pretty layout but it is not the best thing for the performance of high frequency circuits. So, I compromise by using right angles for audio and power wiring and short direct runs elsewhere. For the right angle wiring I sometimes strip and bend the wire into shape before placing it into the chassis. I have not had any resulting issues that I'm aware of by wiring the radio as I did. Figure 5 is the result.

Initial adjustment and tuning of this receiver is not too different from any modern superhetrodyne with one exception. Mixer regeneration, IF regeneration and IF tuning are all interrelated to some degree! Thus, initial adjustment requires quite a bit of reiteration. I found it easier to first align the receiver without IF regeneration present. This just requires temporarily removing C15. Then, align the receiver IF without the band changing coils plugged into the receiver. Finally, install the coils and peak everything one more time. Now you're ready to attach C15 and retune the IF amplifier.

Although the original article used a small variable capacitor for C15, I found a 1 pF fixed mica capacitor to be sufficient. As long as the IF amplifier can be driven into oscillation with the IF gain control R16 comfortably below maximum, then C15 is sufficient. If not, increase C15 to 2



L2 — 8-henry 40-ma. filter choke (Kenyon R-150).
Sw1 — S.p.s.t. toggle switch.
Sw2 — Single-pole, 5-point switch (Mallory 3215J).

Fig. 2 — Circuit of the W8LCO pee-wee transmitter.
C1 — 100-μμfd. midget variable (Hammarlund SM-100).
C2 — 140-μμfd. midget variable (Hammarlund SM-140).
C3, C4 — 0.001-μfd. midget mica.
C5, C6 — 16-μfd. 150-volt electrolytic.
R1 — 50,000 ohms ½-watt.

RFC — 2.5-mh. r.f. choke.
L1 — 90 turns No. 22 enam. close-wound on 1-inch diameter form. Tapped at 50, 30, 20 and 10 turns from shorted end.

Figure 6—Original Pee-Wee schematic (with kind permission of ARRL).

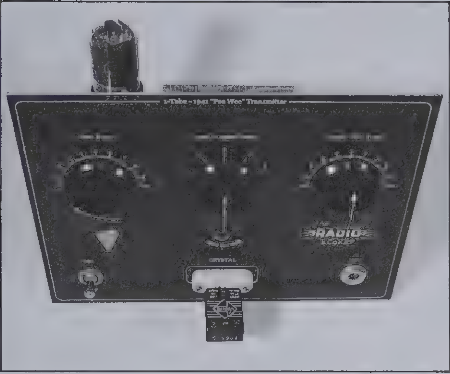


Figure 8—Pee -Wee's front panel.

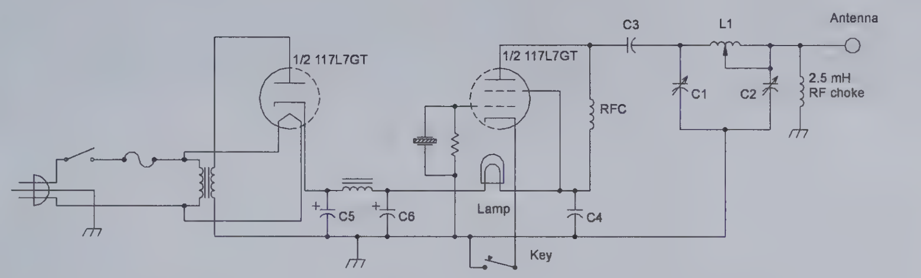


Figure 7—Modified Pee-Wee schematic.

pF and try again. Now remove the band change coils and retune the IF. A few iterations should get it right. You will know the amount of regeneration is just right when a tuning across a CW signal produces a loud response on only one side of zero beat and the signal does not "ring" between dots and dashes. You may also need to retune your BFO somewhat as the higher selectivity and IF retuning may change frequency relationships. When the receiver is retuned correctly, the difference will be readily apparent with the audio image down as much as 40 dB.

Now for the Transmitter!

Once I got my 1941 receiver working, I obviously needed a 1941 transmitter to match it. I thought it might be fun to see if I could find a 1941 QRP transmitter, if there was such a thing. It's true that QRP is popular now and it is certainly amazing what can be done these days with a flea power transmitter and some antenna wire. But, what was QRP communication like seventy years ago? What kind of QRP equipment did hams use back in 1941 in the beginning of World War II and was it effective? That's exactly what I chose to find out and hope you enjoy my experience as I share it with you.

A search through the *QST* archives produced just the right thing. In late 1940, R. T. Lawrance, W8LCO was rebuilding his "big rig" and getting tired of being off the air. He wanted to build an interim replacement fairly quickly so that his progress on his main transmitter would not be interrupted for too long. So, he came up with "A Pee-Wee Transmitter" and it appeared in the January 1941 *QST*. He made the comment in the article that the little rig was so much fun there was little progress occurring on his rebuilding project. All QRPers know that feeling, don't we?

Figure 6 is W8LCO's schematic and as you can see, it has some major safety problems by today's standards because of the AC/DC design. Because non-polarized plugs were in widespread use in that day, it would have been quite simple to rotate the AC power plug and reinsert it in an AC receptacle in a manner that would place the hot AC line voltage lead onto the entire chassis—and onto the operator's key as well! So, I made several changes in his schematic for safety's sake and produced the version you see in Figure 7. I felt that was OK since the general design and transmit power didn't change. Changes included:

- Using a 3-prong AC line cord and connecting the green safety ground lead to the chassis
- Adding an AC line fuse
- Adding a Triad N51-X isolation transformer
- Moving the DC blocking capacitor to a location prior to the output PI filter
- Adding a 2.5 mH RF choke from antenna output to ground to bleed off any B+ in the PI filter

The transmitter was simple enough to build but did contain some clever ideas. The 117L7 diode section was intended as a half wave power supply rectifier for inexpensive AC/DC receivers of the day and the tetrode section was used as the output audio amplifier. The amplifier was supposed to be able to handle up to six watts of input power and the diode section could handle that amount of power and a bit more. Construction techniques for the transmitter were similar to that of the companion receiver. One technique is worth mentioning. I used B&W 3016 coil stock for the transmitter tank coil and found that it was a bit tricky to solder on the wire taps in the coil. Inserting strips of aluminum foil between windings directed the solder to the one winding of interest and made life a lot easier.

So, how did it come out? Figures 8 and 9 show front and rear views of Pee-Wee. Figure 10 shows the few components underneath the chassis. Without the added isolation transformer, the chassis underside must have looked almost empty.

The transmitter is infinitely simpler to operate than the receiver. All that need be done is to insure that the transmitter is oscillating on the correct frequency and null and peak the output PI filter. This is further discussed in the following section on using the transmitter.

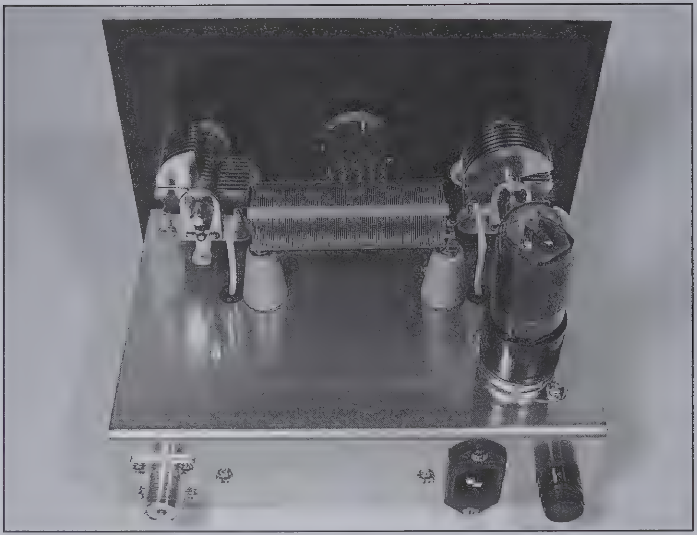


Figure 9—Rear view of Pee-Wee.

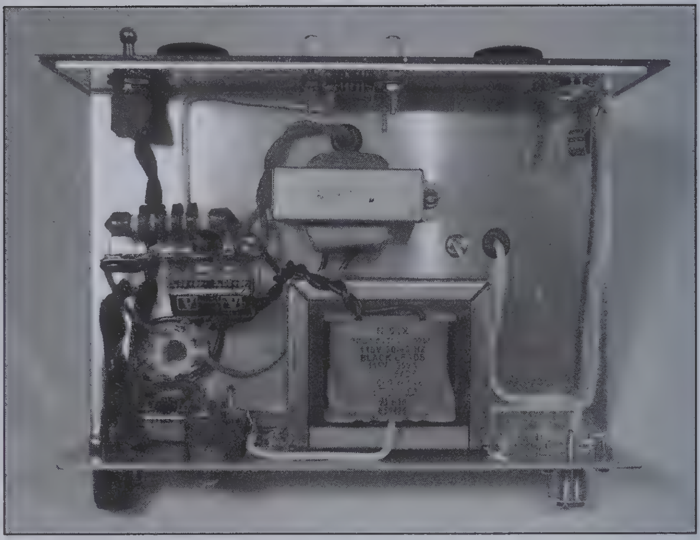


Figure 10—Bottom view of Pee-Wee.

Operating the 1941 QRP Station

As you might expect, QRP operations in 1941 were considerably different from today.

Let's start with the receiver, whose operation is considerably more complex than the transmitter. How do you tune in a contact? Just select the desired band and tune the digital display to the desired frequency, right? Not in 1941! The process was a bit more involved, to say the least.

Our first step is to turn on the AC power in order to apply 6.3 VAC to light the tube filaments so that they can warm-up. 1941 technology was not "instant-on"! Besides the time required for the filaments to warm up, tubes were notorious for drifting until they stabilized. While the local oscillator (6J5) is reaching thermal stability, it will continue to drift in frequency. You could choose to "follow" the drift by repeatedly readjusting the fine tuning, but it's easier to wait until the receiver is stable before making any serious communication —the wait can take at least an hour or so. I understand that some old-time operators would leave the set in standby mode (B+ turned off) almost all the time and let the filaments stay warm for quicker stabilization.

Next step: we have to select a specific set of coils for each band that we'd like to receive. The radio sports coil sets for 160, 80, 40, 20 and 10 meters. Here is when the use of different coil forms within a set keeps Murphy from messing things up.

Next, we want to adjust the Band Set capacitor. This capacitor can be thought of as coarse tuning. It can shift the entire band right off of the calibrated dial scale, so it must be adjusted correctly. What I have done in order to make this job a bit easier is to have printed right onto the National ACN dial face, where the Band Set capacitor is to be set for each band. But, this control is rather touchy and only a coarse approximation of setting it can be achieved by eye.

A much better way is to use a known calibrated frequency source such as a crystal calibrator or even a crystal controlled transmitter to "spot" a known frequency on the National ACN dial (C3). Many tube transmitters actually have a "spot" setting that will allow the transmitter's oscillator to run without sending any power to the antenna and causing unnecessary QRM. Our flea-powered QRP rig does not have such a setting, but routing the transmitter output to a dummy load works just as well.

In order to start receiving signals, several more things must be done. It's not sequentially critical, but we can turn on the B+ at this point. The VR-105 gas regulator tube will immediately glow a purplish-blue color, indicating that the onboard voltage regulation is functioning.

The RF Gain control can be brought up to approximately three o'clock as well as the audio volume control. And, I'd also suggest turning the BFO control to the middle of its range. This also turns the BFO on. With antenna connected, I'd expect to hear some background noise in the speaker. At this point, use of a calibrator or your transmitter as a calibrator will insure that the band set capacitor is set correctly. For example if the transmitter is crystal bound at 7050 MHz, set the tuning dial as close to 7050 MHz as possible and then rotate the Band Set capacitor until the transmitter's signal peaks at the 7050 MHz setting on the dial. Assuming that the National dial face is correctly marked, all other frequencies for the 40 meter band will likely be correct as well.

RF Tune is the last control to adjust and is used for front-end optimization. This control tunes quite broadly at lower frequency bands and much more sharply at higher frequency bands. If you want the front end to tune more sharply, you can advance the RF regeneration control. More regeneration will make each peak much sharper and give the radio more volume. One caveat: when the regeneration is advanced, RF Tune will need to be slightly touched up and re-peaked. But, this operation is fairly simple and only affects the overall volume if not correctly set. Because RF Tune provides the only frequency selectivity prior to converting incoming signals to the IF, this control provides an equal response at both the desired frequency and the image frequency. Because the LO always operates above the desired frequency, the correct setting of the two is the lower frequency setting where the RF Tune capacitor is closer to full mesh.

Finally, we can tune for a signal. Assuming we are interested in SSB or CW signals, AVC should be turned off as the BFO may activate the AVC circuit, causing a reduction in RF gain.

ARRL's recommended method for SSB is to tune with the BFO in "off" position. Tune for maximum signal strength, which should be the center of the SSB sideband signal, and reduce the RF Gain to a point at which the SSB signal is just apparent. The reason for doing this is that the BFO can be overwhelmed and proper demodulation will not occur. Product detectors made this phenomenon less likely. Now, switch on the BFO (C21) and adjust it for a natural sounding voice. On the lower bands (160, 80, 40), tune to the higher side of the operating frequency because convention is to transmit in lower side band (LSB) in those bands. The opposite is true of the higher frequencies. CW reception is quite similar. Start by tuning with the BFO off, find the center of a transmission, and adjust the BFO for the CW pitch that suites you best. Because IF regeneration is used, one should be able to receive CW on one side of the carrier only. For AM operation, the BFO is switched to the "off" position by rotating the BFO control to the 'off' position and the AVC may be used if desired.

Perhaps it's a lot to manage, but it's really quite intuitive after you work with the receiver for a while. Even so, there are a lot of settings to change when changing bands and that was one reason why hams of the day often spent most of their time on a single band for long periods. However, when properly adjusted my 1941 Single Signal Receiver compares quite nicely in performance with my modern ICOM IC730. It just requires more "tweaking" to get to the same place. I can just imagine someone excitedly poring over these adjustments in 1941!

By contrast, setting up the transmitter is fairly straightforward. Being rock-bound, tuning the transmitter to a desired frequency just means choosing a crystal. It is necessary to tune the final pi-network, but that is fairly easy. Attach a dummy load or antenna and turn on the power.

Select one of the coil switch settings, such as in the middle. This next step should be done rapidly as to avoid damaging the vacuum tube. When you first hold the key down, the indicator lamp will come on at almost full brilliance and the 117L7 may glow red. This means that the tube is not oscillating and will overheat rapidly. Sweeping the plate-tune capacitor through its range should yield a spot where the lamp goes out or nearly goes out. This indicates that the oscillator is oscillating and it is the plate-tune setting that we want. If the lamp does not go out, unkey the transmitter and try another coil switch position. Give the tube a short rest to cool down and try tuning again. If you have a power meter that you can put in line with the antenna, you'll see that the output power will peak when the indicator lamp is minimized. I've found that using my homebrew antenna matcher helps maximize power output as well. (I'm using an end-fed wire antenna.) The last step is to optimize power output by adjusting the load capacitor.

This is again an iterative effort of adjusting the load capacitor and then the plate tuning capacitor as the two controls interact. At this point, keying a short text sequence and monitoring the transmission in the receiver is a good idea as some settings of the transmitter controls can cause chirping. It's also a good idea to check harmonics of the transmitted signal to make sure you haven't inadvertently set the plate and loading controls to one of the harmonic frequencies as this is possible. Once you have good settings for each band of operation, you can log these settings and return the controls to that position. Then, just a bit of fine tuning will optimize things and you can start looking for a QSO.

Once you are in a QSO using a separate receiver and transmitter, two tasks must be managed in tandem when switching from receive to transmit and vice versa. Each switchover requires changing the antenna between the two pieces of equipment, and usually changing receiver gain. When transmitting, receiver gain must be reduced in order to monitor your CW transmission without overloading from the transmitter and then gain must be increased once the transmission is over. Additionally, you may need to short circuit the antenna connection to the receiver while transmitting in order to prevent the transmitter from overloading the receiver. Doing all these tasks manually can make you feel like the proverbial one-armed paper hanger. Most hams used external relays to allow all the necessary switching to happen with the operation of a single toggle switch. Some hams muted their receiver on transmit and had an additional very simple, low gain receiver available to do the necessary monitoring. In my case, I simply used a manual antenna switch and turned down the receiver gain. It was a bit cumbersome but worked for my purposes.

My first QRP QSO

It seemed like it took quite a while to get to this last phase but I must admit, it was a lot of fun and a lot of learning to boot!

Out of my haphazard collection of FT-243 crystals, I selected a 7049 MHz to transmit with. 7049 MHz falls within the now defunct Novice and current Technician band, so I deemed it a "safe" place to operate.

I used my end-fed wire antenna and it was the middle of a Sunday afternoon. After careful adjustment to insure that I was operating at a full 2 watts of power, I started sending

"CQ CQ CQ DE KC9KEP KC9KEP K." I made sure to send my call sign very slowly, especially on the second iteration. Being a CW neophyte, I didn't want someone to come back at me at 35 WPM! I listened and heard nothing. Just static. So, I tried again. I know from personal experience that when someone else is CQing, it may take me a few times for me to understand their call sign correctly and get my receiver dialed in, so I tried again. Still nothing.

I tried a third time and still received nothing. So, I started looking through my crystals for another appropriate frequency. But, as I was sorting through my crystals and listening out of the corner of my ear, I heard a faint but clearly familiar string of beeps: "KC9KEP DE KA9HJZ KA9HJZ K." What a hoot! Someone actually heard me!

I have to admit, I got excited and it was probably not my best QSO. But I was able to identify another operator slightly over 100 miles away. And by using only 2 watts of RF power. That's less than a nightlight!

In summary, this project was a bit of an adventure for me. And, it gives one an appreciation for the fine engineering that was being done with the humble equipment available seventy years ago along with the thrill of making a QSO with minimal equipment. I hope it inspires someone else to break out the soldering pencil and try your hand at constructing a similar tube-era project.

—73, KC9KEP

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VHF QRP: More Miles at VHF for the QRP Operator

James Duffey—KK6MC KK6MC@amsat.org

In the last column, I talked about several things you can do to increase your range on VHF. This month, I will discuss a few more things you can do to improve your range on VHF. Recall that at VHF we are operating at or near the noise floor, so every dB counts, particularly with QRP. This month we will add some operating techniques that cost little to implement, but can pay off big.

Go to CW or to One of the Digital Modes

CW has a significant signal-noise-ratio advantage over SSB, and the digital modes have a significant advantage over CW. Table 1 shows the signal-to-noise ratios required for various modes, referenced to a 2.5 kHz bandwidth. As you can see, CW has a 15 to 20 dB advantage over SSB, and the advanced digital modes offered by the WSJT software offer some significant advantage over CW.

The digital modes are available in the free WSJT digital software suite. JT65 is largely used for moonbounce at VHF, which is difficult with QRP. WSPR is not really a QSO mode, so it is of limited usefulness. PSK31 is lightly used on VHF, but it offers little advantage over CW, largely as it was designed to operate with the same bandwidth. ISCAT is a new promising digital mode that I have not had experience with. However it has promise for improving marginal troposcatter on VHF, as well as marginal sporadic E openings.

On VHF, particularly in a contest, if I call a SSB station a couple of times and he doesn't answer, I go to CW and call. Invariably the SSB station hears the CW and tries to work me. Usually I make contact on CW. With the advent of those HF rigs with 6M converage many HF ops are moving up to 6M. They know from their HF experiences CW is productive mode. So there is an influx of new CW ops on 6M. Look for them between 50.080 to 50.100 MHz.

CW ops used to be few and far between on VHF, a holdover from the days when most VHF operation was from Technician class licenses that only needed 5 wpm for their licenses. As a result, much of the CW operations on VHF are at fairly slow speed, 15 wpm or so.

Mode	**SNR***
SSB	**5 dB**
CW (typical operator)	**-10 dB**
CW (highly trained or experienced operators)	**-15 dB**
PSK31	**-15 dB**
ISCAT	**-18 dB**
JT65	**-25 dB**
JT65 (avg. 3 transmissions)	**-28 dB**
WSPR	**-28 dB**
WSPR (avg. 3 transmissions)	**-31 dB**

*Signal-to-Noise Ratio (SNR) required for threshold copy in 2.5 kHz banwidth.

Table 1—Comparison of signal-to-noise ratios required to copy various modes.

If you don't know CW, it is worthwhile to learn. There are lots of ways to learn CW, and that is not really the purpose of this column. However, the online page http://lcwo.net/ offers effective lessons to learn CW as well as practice for those who already know CW.

I will talk more about the digital modes in future columns. They are very effective at VHF.

Give up 100% Reliability and Wait Instead

When using troposcatter as a propagation mode, there is QSB over a range of 13 dB or more. This is inherent in the mode, where the scattering volume does not always have the same size or number of scattering blobs. So if you are willing to wait, you can often catch the QSB at a high point and make the contact. It is simple, but effective. Keep trying to make the QSO. This seems to be obvious, but lots of ops give up too quickly on a QSO.

Use Standard Operating Practices

With signals up and down as experienced by troposcatter, or only there part of the time, standard operating practices help a lot in making contact.

1. *Use standard phonetics on phone*—When exchanging calls, I always use standard phonetics. It is a good practice to get into. Exchanging calls using only the alphabet with no phonetics under weak signal conditions is a recipe for confusion. Too many of the letters sound the same, and weak signals only enhances the similarity. The best way to train yourself ot do this is to use phonetics all the time, whether the signals are weak or not.

2. *Use single digit numbers*—When exchanging grids, say Delta Mike Six Five, not Delta Mike Sixty Five for DM65. Too many of the decades sound alike when signals are weak. Sixty sounds like fifty, seventeen sounds like seventy and so on. Using the single digit numbers helps a lot.

3. *Be concise in your exchanges and use standard protocol*—Don't give any extraneous information until you have exchanged and verified the required information. This just confuses things. Until you have exchanged and acknowledged grids, the potential for confusion is high. It is surprising how towns, roads, antennas, and rigs all can sound like grids under weak signal conditions.

When signals are weak, it is customary to exchange calls until you have copied both sets of calls, then exchange grids, then acknowledgement. It is also customary to do this on 15 or 30 second intervals, with the westernmost station sending during the first interval and alternating thereafter.

Install a Preamp

Ideally, one would like the noise that comes out of yor rig to be determined by sources external to your station. On HF this is usually the case, on 6M it is often the case, on 2M and above it usually is not. So, if you have a weak signal that is stronger than the external noise, but weaker than the noise generated in your system, then you will not be able to hear that signal. The solution is to use a preamplifier before your system that will increase the external noise and weak signal above the noise of your system. While the ideal place to put the preamplifier is at the antenna before the feed line as the feed line loss acts to increase the noise figure, a preamplifier located in the shack will usually help on weak signals unless the feed line loss is very high.

You can easily build a preamplifier for terrestrial use; look in the ARRL *Handbook* for plans. If you have a transceiver without a separate receive input you will need to rig up a relay or two to switch the preamp in and out of the path as you do not want to transmit through the preamp. For QRP, switching can be done fairly simply and there are several RF actuated relay circuits available.

Commercial preamps are available, and among the many choices, the ARR RF switched models are reasonably priced and ideal for QRP use (www.advancedreceiver.com/page7.html).

Many of the popular brick linear amplifiers have built in preamplifiers and while these usually are not the ultimate in performance they will improve your receive performance enough to be worthwhile.

As pramps increase the signal level at the receiver input, they will exacerbate any problems that your rig has with strong nearby signals, so only use the preamp with weak signals. For signals well above the noise, or if your receiver has problems in a strong signal environment, turn the preamp off.

I will talk more about preamps in future columns.

Reduce the Bandwidth

Noise from the receiver that reaches your ear and is processed by your brain along with the desired signal is a function of the bandwidth of the receiver. If this bandwidth is broader than the signal is wide, then the signal to noise ratio your ears hear, and your brain processes, will suffer. Narrowing down the bandwidth helps substantially. This is particularly noticeable when listening to a CW signal near the noise in a receiver set to a SSB band width. The CW signal occupies 100 Hz or so, while the noise occupies the entire bandwidth, usually 2.4-3.0 kHz, but sometimes more. Narrowing the receiver bandwidth from the SSB bandwidth to 400-500 Hz will make the CW signal pop right out of the noise. In going from 2.4 kHz to 400 Hz the signal-to-noise ratio (SNR)has improved by nearly 8 dB! Further improvement in SNR is possible by going to even narrower bandwidths, but some find listening to such narrow bandwidths tiring.

While some operators can train their brains to narrow down on the signal, this is a learned process and not everyone is equal to the task. Plus, I, and others, find listening to the full bandwidth noise to be tiring. If you have a rig that can accommodate a narrow filter in the IF stage, by all means install one. It will virtually make a new rig out of your old one. If your rig won't allow you to install a narrow filter there is still a way to get the advantages of a narrow filter. Use an external audio filter. If you like to build, the New England QRP club offers the NESCAF Kit, http://newenglandqrp.org/nescaf, at $31, a good buy. External audio filters were once a hot accessory commodity, but advances with built in DSP on modern rigs have pretty much made external audio filters obsolete. So, you can pick up bargains in used audio filters. I am partial to the DaTong FL-3 and its brother the FL-2 (without the automatic notch filter). These were never sold in large quantities, so they can be hard to find. The Bencher XZ-2 is also a good choice. These are analog filters. On the digital side, the Timewave DSP 9 and DSP 59 offer good performance at reasonable prices.

Keeping the Power up as the Battery Declines

On many rigs, as the voltage available to the finals declines, so does the power out of the rig. Most rigs that we use that are nominally referred to as 12 volt rigs, only put out their full power on 13.6 volts; the voltage of a fully charged automobile battery. If you run off a battery, as its voltage declines, so does your power out. This is not true of all rigs; the FT-817 for example puts out the power set down to very low voltages. But if yours doesn't, and most don't, look for a DC-to-DC converter that can take whatever your battery voltage is and raise it to 13.6V so you get the same voltage out for nearly any battery voltage in. I use a N9XJK converter, but at 40 amp capability, it may be a bit of overkill for QRP. There are other options; there are numerous listings of DC-to-DC converters on e-bay, Powerstream sells several models with lower current capabilities. Beware of noise from these devices though; while the N8XJK is designed for hams and is low noise, commercial offerings may not be. These can usually be quieted by filtering on the input and outputs.

Beware also, that with such a battery booster, it is possible to drain the battery down to very low voltages before they stop operating. Your battery can only take so many such deep discharges. Most boosters have low battery warnings and automatic shutoffs, but you need to pay close attention to your battery voltage when using such a device.

Increase Power

At VHF, QRP, as defined by the ARRL for contesting, is 10 watts out PEP. If you are running 5 watts, you are only running half of what of what you can run at VHF and still be considered QRP. The FT817 is limited to 5 watts, so going to 10 watts will help your signal by 3 dB, a worthwhile improvement on VHF. Ten watt amps with a low gain are not commonly available, but there are a myriad of amps available in the 20 to 30 watt range designed for hand helds and these can be used at the 10 watt level by reducing the drive level. If you don't have a preamp, many amps have one built in that will do an adequate job.

While I love the fun and challenge of QRP, it is not a religion, at least not to me. If you want to add the 150 watt brick go ahead and do it. That will open a whole new world at VHF for you, but that is another story for another magazine.

Costs

Little if anything worthwhile comes for free, and higher performance at VHF is no exception. All of the suggestions I have made in this column are fairly inexpensive though, and all offer significant improvement. Some, like going to CW, waiting for QSB peaks, or using proper operating procedures, are free.

Upcoming Events

The January VHF contest is always a challenge as it is cold for the rovers and portable ops, and enhanced propagation is usually nil. Now is the time to start improving your station for the contest. The January contest has traditionally been hotly contested in the club competition. Look for a local club to submit an entry for in the club competition I find that committing to submit an entry for the club makes me more dedicated during the contest and hence improves my contesting skills.

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Send comments and suggestions for the QRP VHF column to KK6MC@amsat.org

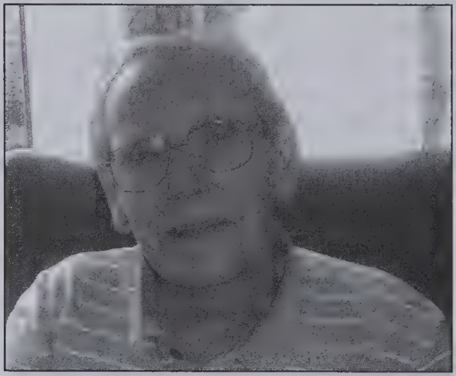
QRP World News

Oleg “Mr. 72” Borodin—RV3GM
rv3gm@mail.ru

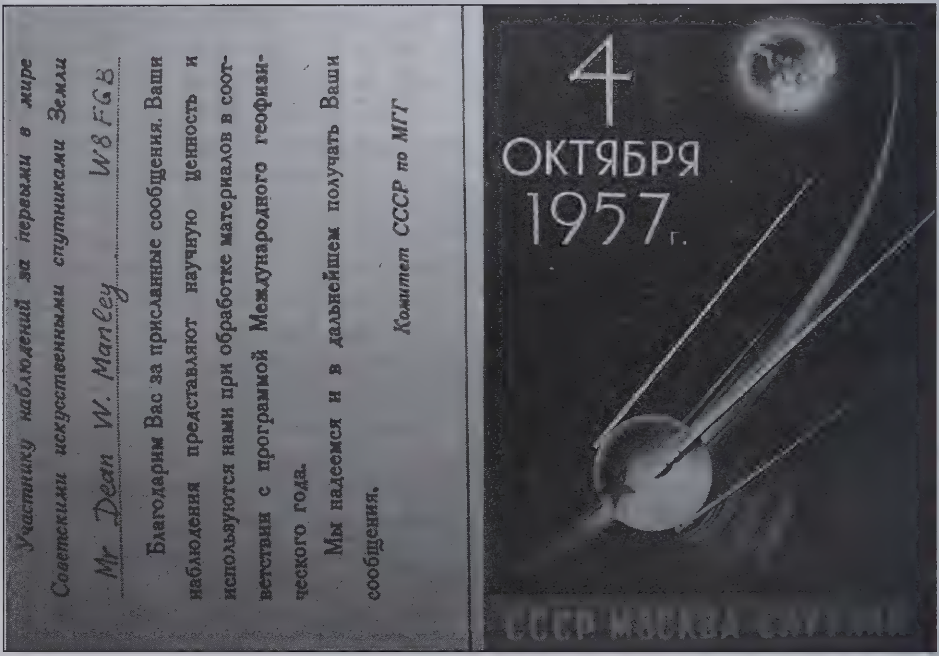
At first, I’d like to present to readers the revived World QRP Federation (WQF). In the beginning WQF was organized in the middle of 1980s under the initiative of G-QRP Club and personally Rev. George Dobbs G3RJV and Angus Taylor G8PG (SK). The general purpose of WQF was to coordinate and provide common standards for QRP power level, and decides other common questions between QRP clubs of the world. Angus G8PG had many correspondences with QRP clubs that time. Finally, we have universal standards for QRP of 5 watts output for CW and digital modes and 10 watts PEP for SSB.

The following great doing of WQF was in 1987, when I offered to use a special code 72 as a good wishing between QRP operators. Chairman of G-QRP Club Rev. George Dobbs G3RJV supported this idea and Angus Taylor make a polling between other clubs about agreement of using new “72” code. So, we are all using “72” code everywhere now.

The first Chairman of WQF Angus Taylor G8PG died in Spring of 2011. After discussions and advices with some QRP clubs chairmen I have get a blessing from Rev. George Dobbs G3RJV to revival and continue of WQF activity. First of all, the web-page www.wqrpf.org and *WQF-News Bulletin* was created. The bulletin dispatched for all chairmen and staff of QRP Clubs of the World. Also, any wishing low power operators may subscribe to bulletin.



Taylor, G8PG (SK), first Chairman of the World QRP Federation.



Участнику наблюдений за первыми в мире
Советскими искусственными спутниками Земли
Mr Dean W. Manley W8FGB

Благодарим Вас за присланные сообщения. Ваши наблюдения представляют научную ценность и используются нами при обработке материалов в соответствии с программой Международного геофизического года.

Мы надеемся и в дальнейшем получать Ваши сообщения.

Комитет СССР по МГГ

The original 1957 Sputnik QSL card sent to SWLs who heard the spacecraft.

The World QRP Federation accumulates and produces any info and news of our QRP hobby. It is not a control, checking or managing organization. It’s just coordinate and informative only. There are no duties, the rights limitation and additional rules for any QRP clubs of the World. The same time, all clubs of a World can consider themselves as World QRP Federation members. In the future WQF planning to rename to the World Low Power Radio Federation (WLPRF)

The 1st Sputnik Days of Activity

I’d like to inform about new interesting project of well known low power operator Michael Rainey AA1TJ. Mike offered to organize unusual activity days “Sputnik Party” devoted to memory of the 1st Sputnik launched in USSR in October 4, 1957. Just a short visit to history. The 1st Sputnik transmitted dots “bip-bip” on the frequencies 20005 and 40003 kHz by on-board transmitter with power output of 1 watt to a twin V-dipole. The TX operated from October 4 to 26 (22 days). Military sub-miniature “rod” tubes were used in Sputnik TX. Mike offer to build the same prototype of a 1 watt Sputnik TX using two Soviet valves 1ZH24B (oscillator) and 1P24B (power amplifier) on ±21060 kHz frequency. The same activity period offered—October 4 to 26. All participants may send identification—six “bip” before CQ, example:

* * * * * * CQ CQ de AA1TJ pse K

This is not a contest and there is not any special exchange and rules. It’s activity days only. For all interested operators Mike produced partial kits for “sputniker” TX assembles (two “rod” valves and 21060 xtal). Sorry, but all 70 kits was sent very quickly for builders from US, UK, Cuba, Russia, Germany, Australia, etc.

QRP
LP
WORLD LOW POWER RADIO FEDERATION

Anyway, all hams may take a part in Sputnik Days using any possible radios with 1 watt output power. The first time is important to become sure in interest of Sputnik Party before a work on future rules and exactly details. The circuit of "Sputniker" TX and other interesting info can be found at Mike's blog page here:

http://aa1tj.blogspot.com/2011/07/sputnik-qso-party-transmitter-prototype.html

There are no logs in Sputnik Party but a short description of used radios/antennas, an interesting QSOs and TX pictures are appreciated. The World Low Power Radio Federation planning to award all participants used home made valves TX in the Sputnik days which will send a stories and TX pictures to Mr. Rainey AA1TJ at: mjrainey@gmail.com, and "Mr. 72" Oleg RV3GM at: mr72@wqrpf.org

QRP vs LP —What is Correct?

Here is a reminder of the Q-code assigned by the International Telecommunications Union (ITU):

"QRP?" — Must I decrease power?
"QRP" — Yes, decrease power

In fact, both ways means action "to decrease." So the phrases of "QRP Club" or "CQ de RV3GM QRP pse K" are logic nonsense. In other words the "QRP Club" means "Let's to decrease power Club" and "CQ I'm RV3GM, decrease power please" Hi-hi! No doubt, for a long time we are all using the Q-code "QRP" incorrectly.

Otherwise, we have a good usable phrase "Low Power" (LP). See some examples below:

- Low Power Club
- Low power operator (shorter—LoPOper or Loper?)
- CQ CQ de RV3GM LP pse K
- MY RIG IS LP 3 WTTS
- KH6B de RV3GM both LP pse KN
- and so on…

It looks like logical and correct phrases. What do you say if anybody asks you: "Who are you or what is your hobby please?" You can reply: "I'm QRPer". "What is it?" Next you must to explain: "It means Low Power Operator." So, where is logic here?

The same is so about QRPp (pi-pi-pi). The most exactly designation is VLP (Very Low Power, less than 1 watt).

Finally, let's correct our old errors all together! Try to use LP and VLP instead of QRP and QRPp. Believe it will be more beautiful and more precisely.

••

Send QRP (perhaps "LP") international news items to Oleg at: rv3gm@mail.ru

From Sardine Sender to Honor Roll in 10 Years – QRP!

John Harper—AE5X

Me, pointing down the street, "What direction is that?"
Dan WG5G, "South Sudan!"

Until recently, I'd never actually met anyone on the DXCC Honor Roll. I imagined such operators as being blessed with rural, mostly coastal locations and antenna farms that were far out of reach of the average ham. In my mind's eye, they also had state of the art equipment which had been frequently upgraded over the years, thus enabling a DXer to reach that ultimate DXing goal.

I was therefore quite surprised as I drove up to the QTH of Dan Walker WG5G. I was even more surprised when I saw the simplicity of the equipment that allowed Dan to achieve Honor Roll status.

Dan lives in a typical residential neighborhood in San Antonio, Texas and is still using a rig he bought second-hand many years ago. That station consists of Kenwood's QRP-only TS-130V, external VFO, remote coax switch and Heathkit QRP wattmeter and tuner.

Upgrades to WG5G over the years have been limited to the antenna and, although Dan currently has an enviable quad at 50 feet, that wasn't always the case. But regardless of the antenna in use, rare DX callsigns have been a permanent feature of his logbook.

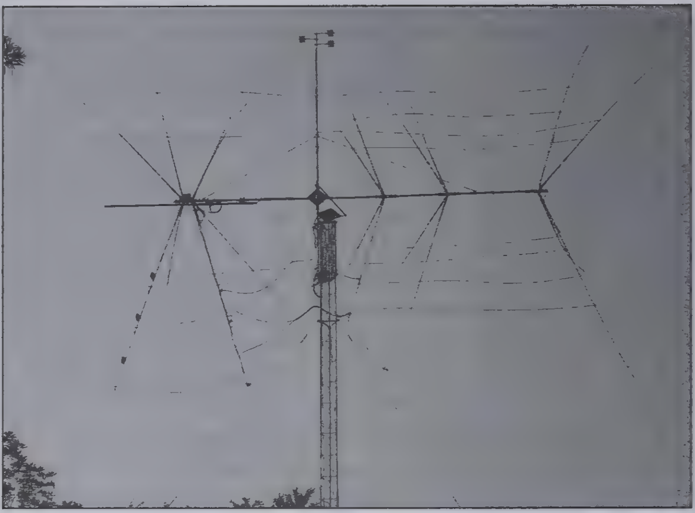
Licensed in 1978, Dan didn't become active on the ham bands until 1984 when he upgraded to Extra. His first rig was Doug DeMaw W1FB's Sardine Sender for 80 meters, followed very soon thereafter by the TS-130V. Less than a year later, 216 countries had been confirmed using a 2 element Yagi at 35 feet from a house at the bottom of a hill.

Dan Walker, WG5G, in his QRP hamshack.

Storm damage has been an unwitting contributor to Dan's success in that every time an antenna was damaged, the philosophy has been to replace or rebuild with something a notch or two better. The Yagi was replaced with a 2-element quad (still at 35 feet) which took Dan's DXCC/QRP count to 300.

At that point, the quad was modified to include a heavy duty boom and 3 more elements, making it a 5-element quad with 13 dB gain on a 35-foot boom. This, a short move in QTH to the top of the hill and a new 50-foot tower took Dan's all-time DXCC count to 339 (338 confirmed, awaiting the QSL from STØR) with 332 current.

(continued next page)



A good antenna like WG5G's quad helps boost a QRP signal—but it's not absolutely necessary for successful DXing.

This may well be the highest DXCC total achieved with QRP and makes Dan the only person to achieve Honor Roll status with QRP power.

Keep in mind that after working 175 countries or so, each new country is usually associated with a pile-up. After 250 countries, those pile-ups get huge and often consist of callers from several continents with power levels ranging from 100 to 1500 watts—yet Dan was repeatedly getting through them with 5 watts.

There is a common misconception that the heavy lifting in a QSO containing a QRPer is done by the non-QRP station, due to his being able to pull the weak signal out of the muck. While there may be some truth to that in a limited way, it overlooks a very relevant fact of DXing: that a DXpedition isn't listening specifically for QRPers—they're just trying to work as many stations as possible during a particular opening. They have no way of knowing (and don't care about) power levels of those calling; they're simply working those they hear.

The fact that the QRPer gets heard by the distant station in a pile-up often containing many dozens of QRO callers is where skill and know-how come into play and there are two schools of thought on how to make that happen. In both cases, operating split is the great equalizer, diminishing the effect of various power levels and antenna gains in use by the many callers and injecting into the formula the opportunity for skill and technique, which, if they could be quantified, would be expressed in dB.

One strategy says to call where there is a clear frequency within the DX station's listening range, with the theory that he'll hear you there in the clear.

Dan's method, which is echoed by Bob Locher W9KNI in *The Complete DXer*, is to zero beat the station currently being worked by the DX and then call there after their exchange. The WG5G logbook is a testament to the effectiveness of that method. This seems like intuitive, common knowledge but the fact is that so many DXers use a "good enough" approach to zero beating that often places them outside the passband of the target DX station's receiver.

"Good enough" isn't good enough. Precision and accuracy count, and often get the QRPer into the logbook when QRO operators are still calling.

Regarding pile-ups—to the beginning or non-DXer, a large CW pile-up often sounds like an overwhelming cacophony of noise that can be intimidating to jump into. Dan emphasizes that there is method in the madness and that the effective size of the pile-up is usually smaller than it seems due to the fact that many of its participants, rather than using a strategy, are simply calling on unproven frequencies within the split range, thereby eliminating themselves as valid competitors.

Dan's DX Elmer back in the day was Tex Kennedy N5TX. For new, and not so new, DXers looking for an Elmer for fleshing out the above techniques (and others), Dan highly praises *The Complete DXer* as a valuable how-to resource chock full of good info on the techniques of getting logged by rare DX stations, even though one may be "outgunned" in terms of power or antenna configuration.

I suppose we've all known people who can tell you who won a particular baseball or football game years ago, along with the names of those most responsible for the win. Dan has a similar knowledge of the operating habits of other DXers as well as of his own methodologies that worked for a given DXpedition and credits the dedication to the hobby of many others who have organized and operated the DXpeditions that fill his logbook.

I asked Dan what he thought accounted for him being the only QRPer to make DXCC Honor Roll and thought his answer would be some nugget of information I could apply to my own DXing. Dan's explanation was that, even though there are other QRPers with 300+ countries confirmed, most of them migrated to QRP after first having been QRO DXers. Dan has been QRP from Day 1 and this fact has prevented him from having to re-work rare entities for QRP credit.

He also mentions that operating at 5 watts gives one an increased sense of band conditions and antenna effectiveness, the subtleties of which might go unnoticed at higher power levels.

Now at the point of needed entities only coming available every year or two, I wondered if DXing had grown boring. "Not at all," was the reply. While waiting for DXpeditions to those entities, Dan stays sharp by engaging in pile-ups for band-countries and participates in contests from time to time, having won World (CW QRP) in the ARRL 10M Contest last December.

In addition to DXCC Honor Roll, Dan also has WAS/QRP and WAZ/QRP. ●●

2012 QRP-ARCI Contest Schedule

7 January 2012	**Pet Rock Sprint**
29 January 2012	**Winter Fireside SSB Sprint**
10 March 2012	**HF Grid Square Sprint**
7-8 April 2012	**Spring QSO Party**
27 May 2012	**Hootowl Sprint**
16 & 17 June 2012	**QRP Shootout**
8 July 2012	**Summer Homebrew Sprint**
25 August 2012	**Welcome to QRP**
8-9 September 2012	**The Two Side Bands Sprint**
13-14 October 2012	**Fall QSO Party**
29 November 2012	**Top Band Sprint**
16 December 2012	**Holiday Spirits Homebrew Sprint**

Cool Stuff for Active QRPers!

New! Add Some Class to your Shack!

Wooden plaque with your callsign, on 7″ × 7″ hardwood.

Available from: www.HamPlaques.com/o-qrp.htm
(QRP ARCI receives a commission from these sales)

Get Mugged!

Generous-sized coffee mug with the club logo on both sides. The mug is gray with printing in blue.

$10 ea. postpaid

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A Second Look at the W4TMR 160M Inverted Delta Loop

Paul Stroud—AA4XX aa4xx@arrl.net

As fate would have it, a friend introduced me to Gene Bowman, WB4MSG, at the Winston-Salem, NC hamfest during the Summer of 2010. As soon as I heard Gene's call sign, I remembered from the National Contest Journal that he was a serious QRP contester who always scored high in the 160M contests.

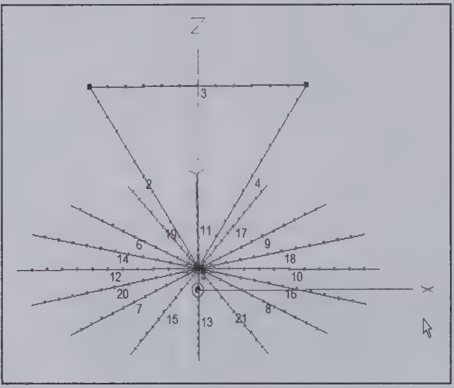
During our ensuing discussion of Top Band contesting, it became evident that Gene was willing to share the secrets of his success. I asked him what kind of antenna he used when he won First Place SSB World in the CQWW160 Contest. He told me that if I had a few minutes to spare, we could ride out to his house to see his 160M antenna. I had to pinch myself a couple times to make sure this wasn't a dream!

Gene mentioned that a full write up of his 160M antenna appeared in Jan 2010 *QST* (160 Meter Inverted Delta Loop by Charles Kluttz, W4TMR, pp.40-41). Interested readers are encouraged to review the original article.

I was really surprised when we arrived at Gene's QTH and saw a rather simple vertically polarized half wave loop strung between two trees. Gene's loop resembled a rectangle, with the top horizontal section about 60 feet high and about 90 feet long and the sides (each about 45 feet long) held in position by tag lines to nearby trees. The feed point was at the center of the bottom "not-so-horizontal" 90 foot long section. The best way I can describe the feed point is to ask you to visualize a 4x4 wooden post about 6 feet tall and positioned directly below the center of the lower horizontal section of the loop. Now visualize the center feed point of the loop slanting downward to the top of the wooden post, with each feed point wire end secured to its own electric fence post insulator. These two insulators are installed on opposite sides of the post. Now imagine several more insulators spaced every 12 inches directly below the top feed point insulators which allows the construction of a balanced feed line which physically lowers the feed point to about 8 inches off the ground. One of the feed point wires is connected to a system of buried radials. The other feed point wire is connected to the station coax feedline (after appropriate matching).

I vaguely remembered the aforementioned *QST* article, but I had no idea that this antenna was responsible for a number of 160M records posted by both W4TMR and WB4MSG. I had considered it to be yet another marginally effective backyard 160M antenna. With new perspective, I determined to build my own version of this contest proven antenna.

This article chronicles my construction of the W4TMR loop and its performance relative to previous 160M antennas I have used. My version differs from the original W4TMR design in that I implemented a number of elevated radials. The overall antenna system can be best be demonstrated with the following EZNEC view:



Wires #2, #3, and #4 comprise the large loop, with each of these wires being approximately 90 feet long. My loop is strung between two tall trees using weedeater line.

Wires #6 - #21 show 16 radials, each 81 feet long. I actually installed 23 radials on my system and intend to add some more this Fall. I stepped off the maximum length of radials that would fit and determined that I could fit a large number of radials, 81 feet long. The radials are 9 feet high and most of the radials are #17 aluminum fence wire. The radials that feed into the woods use #14 insulated wire to prevent losses due to the wires coming into contact with tree limbs. The far ends of the radials are tied off to trees using lightweight rope without insulators. The near end of each radial end ties together and then connects to the lower end of loop wire #2.

Here's a photo of my radials attached to an aluminum ring of fence wire near the top of the 4x4 pole:

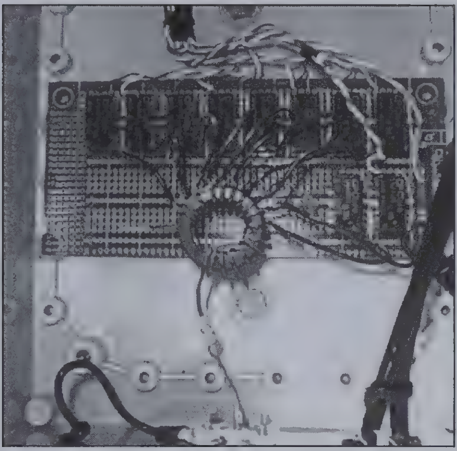
EZNEC predicts a feed point impedance of 70 ohms between the lower ends of wire #2 and wire #4 (antenna view diagram). In my case, the feed point impedance was closer to 60 ohms, possibly indicating some degree of mutual coupling with my tower or trees.

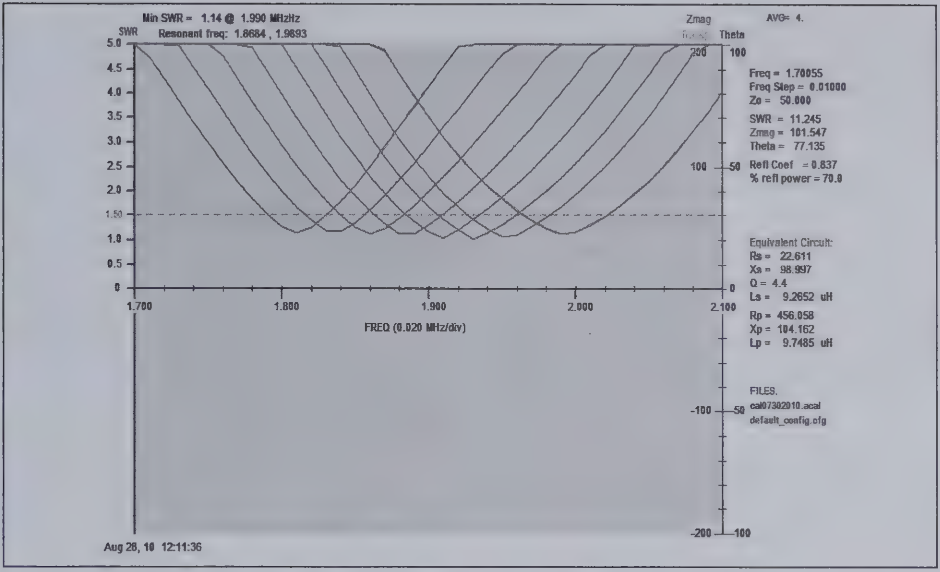
I resonated my loop to 2.0 MHz by trimming the feed point ends of wires #2 and #4. I use an AIM-4170c antenna analyzer, which is a marvelous tool for this type of work. In order to establish resonance at 1.800 MHz, EZNEC predicted I would need a series inductive reactance of about 200 ohms inserted between the bottom end of wire #4 and the station feedline. This translates to an inductance of 17.5 uH.

How do we convert an XL of 200 ohms to an L of 17.5 uH? Let's use the formula $XL = 2\pi FL$. By manipulating this formula, we get $L = XL/2\pi F$. Substituting our values for XL and frequency, we get $L = 200/(6.28 \times 1.8)$, or 17.5 uH.

Now that we know what Inductance value is required to lower the loop's feed point resonant frequency from 2.0 MHz to 1.8 MHz, we need to select a suitable toroid core and determine how many turns are needed to approximate the required inductance. In my case, I used a FT-125K core from my junk box, which I knew was suitable for use on 160M. I wound 17 turns of #16 enameled copper wire on an this core, which resulted in an inductance of 21.3 uH, as measured with my AIM analyzer.

I knew I wouldn't need quite this much inductance, but decided not to remove any windings from the core. The picture below shows the toroid core with 17 windings and ten taps, which are selected by relays. I ended up only using eight taps.





Min SWR = 1.14 @ 1.990 MHzHz
Resonant freq: 1.8684 , 1.9893
AVG= 4.

Freq = 1.70055
Freq Step = 0.01000
Zo = 50.000

SWR = 11.245
Zmag = 101.547
Theta = 77.135
Refl Coef = 0.837
% refl power = 70.0

Equivalent Circuit:
Rs = 22.611
Xs = 98.997
Q = 4.4
Ls = 9.2652 uH
Rp = 456.058
Xp = 104.162
Lp = 9.7485 uH

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AIM4170c display of VSWR measurements with different taps.

The FT-125K cores may be a bit difficult to find these days. An FT-114-61 core may be substituted, using 15 turns of #16 or #14 enameled wire. In my case, I found that a series inductance of 19 uH provided loop resonance at 1817 kHz and a series inductance of 4.2 uH provided loop resonance at 1990 kHz.

By selecting individual taps, the loop can be resonated from 2.0 -1.8MHz in 25 kHz steps,while maintaining a maximum SWR of <1.5:1. The overlay above from the AIM analyzer displays the SWR plots as the eight taps are selected. The taps are selected by energizing individual relays via a control box in the shack.

Are you beginning to see why I like the AIM 4170c Analyzer so much?

I used "direct buriable' ethernet cable from a local building supplier to provide the relay switching. The use of eight taps is clearly not necessary—four taps would suffice to cover the entire 160M band if a bit more SWR could be tolerated.

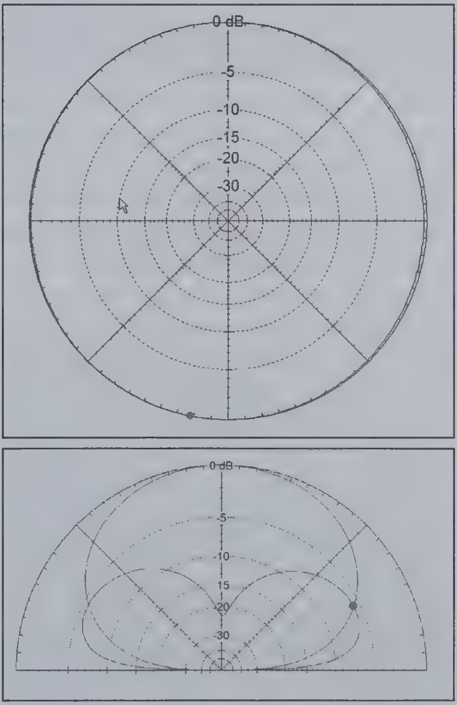
Directional Characteristics

This loop provides an omnidirectional pattern as can be seen from the EZNEC hoizontal pattern plot.

W4TMR Loop vs. 160M Dipole

I had always considered my 160M dipole (up 70ft) as being the best Top Band antenna I could ever muster. The EZNEC overlay compares the elevation plots of W4TMR loop and the reference dipole

The 160M dipole response is commonly referred to as being a cloud warmer, since the maximum take off angle is 90 degrees relative to the horizon; Still, the dipole is a very useful antenna, almost always outperforming the vertical for stations within a few hundred miles. The W4TMR Loop radiates maximum power at a take off angle of 26 degrees. The overlay shows that the dipole and the vertical are neck-and-neck at this take off angle. The vertical shows significant gain over the dipole at all take off angles lower than 26 degrees. To put his into perspective, I find that from my central NC location, Caribbean stations and close in states are stronger on the dipole, while Europe, Midwest USA, and most other DX stations are stronger on the vertical.



EZNEC plots—horizontal pattern (top) and overlay of loop and dipole vertical patterns (bottom).

Was the W4TMR Loop Worth the Time and Effort ?

During last January's CQWW160M CW Contest (QRP class), I found myself selecting the vertical (over the dipole) for 95% of the stations I worked, as only a handful of close in stations could not be worked with the vertical.

Prior to this particular contest, I had never worked EU on Top Band running QRP. I only had one West Coast station confirmed (OR). The band conditions last January were good, and the W4TMR Loop allowed me to work my first EU station. Just before daylight local time, I heard a weak KH6CC calling CQ in the clear. I told myself this was REALLY going to be a stretch! KH6CC came back with , "QRZ AA4??" Within a minute, he had my call and exchange, and I started shaking!

By the time the contest was over, there were 469 stations in the log, including 56 sections and 14 countries. I missed 160M QRP WAS by three states-Alaska, ND, and MS. A number of North American QRP'ers left me in the dust, but this new antenna allowed me to experience a level of performance that was quite exhilarating.

I'd be happy to share my W4TMR EZNEC antenna files with anyone who would like to model the W4TMR Loop. I can supply two files-one with ground mounted radials and one with elevated radials. Please feel free to email me if you have any questions.

Hope to CU on Top Band,

—Paul, AA4XX

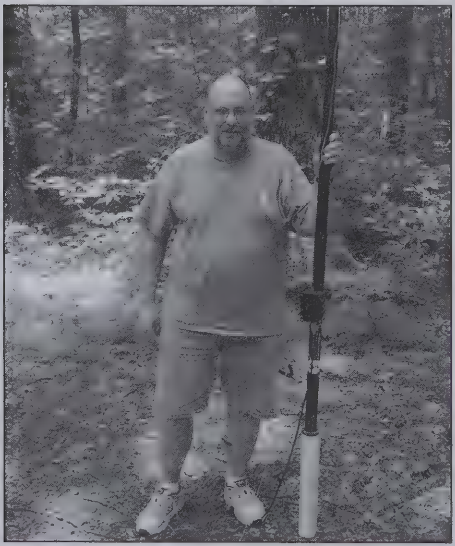
French Creek QRP Renegades 2011 Field Day

Edward R. Breneiser—WA3WSJ

This year the French Creek QRP Renegades again set up camp at French Creek Sate Park in southeast Pennsylvania. Friday afternoon these strange creatures started to arrive at Group Tent Site Number Ten! Yes, these creatures had large ears and many had an extra large right hand? The large ears have developed to pull weak signals out of the air. Much like a bat uses its ears to listen. The right hand thing seems puzzling at first, but these creatures, over time, have developed extra large right hands to use what some call the Morse key or paddle to send code.

I arrived at camp and started to set up my station. My station would be used to operate PSK31 and SSB and some CW. I don't use a tent as they get to hot for most Field Days here in Pennsylvania. I've learned that the station needs air flow through it to stay cool in the hot June summers here in Pennsylvania. I use a dinning canopy that is screened in on all four sides, but has a closed top. I then add tarps on the sides as needed to keep the sun and rain out. This allows air through the station and keeps the operators cooler.

As I was setting up my station, Craig LaBarge, WB3GCK, arrived and set up his station which would be our CW station. This year Craig set up a tent to sleep in and operate in at camp. I also sleep in my station screen room as may be seen in the above picture. Soon after, Ed, K3YTR arrived and set up his VHF/UHF station. Ed likes to operate 6m and 2m for us during Field Day. Then Gary Smith, KB3UMN arrived at camp. Gary is a new ham and was there to learn and have some fun.



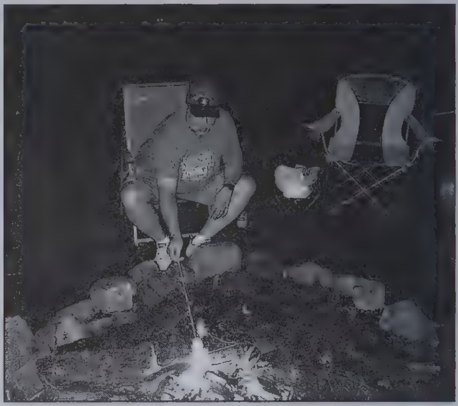
WB3GCK with his Up&Out UN-UN Antenna.

WA3WSJ at the PSK31/SSB station, French Creek State Park.

Friday night we all went to a nice Italian Restaurant near the park for dinner and to tell war stories. You know I worked this station, but couldn't work that one. We all ate good and had a few beers with our meals—hi!

Back at camp we now do something that has become a tradition for us. Crag started roasting marshmallows at our nightly campfires. This caught on and we now all just stop what we are doing after the sun goes down and sit around the campfire, roast marshmallows and talk! Craig, WB3GCK, put us on to roasting Peeps! Yes, those colorful bunnies that appear near Easter. The white Peeps are the best as they roast to a crunchy shell and soft in the middle!

WB3GCK making his 100th CW QSO at Field Day!



Craig, WB3GCK roasting marshmallows (and Peeps) by the campfire.

Right about now you're wondering do these guys actually do any operating? Well, yes we do, but it's always a casual Field Day operation for us. We used the call sign W3PBC and ran 2A-EPA. This year Craig, WB3GCK built what we called his Up&Out UN-UN Antenna. This thing played like gang-busters! It's actually a form of an inverted-L antenna just feed with fifty-ohm coax using a 1:1 UN-UN and supported by a collapsible thirty-one foot pole.

In fact this antenna worked so well that Craig earned the very first French Creek QRP Centurion Award for making at least 100 contacts by himself at Field Day!

Yes, that's a Yaesu FT-817 with a LDG Auto Tuner feeding a 1:1 UN-UN to the

Breakfast—Left to right is WB3GCK, K3YTR and KB3UMN.

Gary Smith, KB3UMN operating SSB.

antenna. Craig is set up in his tent using a small table and it worked great for Field day. The battery is under the table and he ran all weekend on it! He had a ball running 20m CW and I took this picture as he worked his 100th contact!

This is the last picture ever taken of our friend, KB3UMN. Gary was a new ham and this was his first and final Field Day. Unfortunately, Gary became a silent key in August. We will all miss you buddy!

Our total QSO count was 100 by WB3GCK and another 82 by WA3WSJ and Gary, KB3UNM (new op). WB3GCK ran CW only and we ran PSK31 and SSB. Ed, K3YTR had some QSOs on 6M too. It was a FUN Field Day with good friends and good food. We plan to do this next year and once again we will run QRP!

—72 de WA3WSJ

An Evening of QRP on Monte Sano, Southern Style

Craig Behrens—NM4T

QRP lightning struck again on top of Monte Sano in Huntsville, Alabama. This time, it struck at a rustic cabin on August 20th, a sultry, Southern evening. And ... it was just what the QRP event instigators had hoped for.

Three weeks prior to this evening on the mountain, Randy Moore-KS4L and I were swapping emails about potential PoTA (Parks on the Air) activities when our conversation shifted to what QRP opportunities the upcoming Huntsville Hamfest might present.

"Randy, you know we had a major QRP outing on Monte Sano to celebrate QRP ARCI's 40th Anniversary on the weekend of the Huntsville Hamfest back in 2000."

"I was tied-up that weekend and missed that event," Randy said. "But I heard it was really fun."

"We really had a blast," I said. "It's kind of late with the hamfest just a few weeks from now, but maybe we could pull something together for this year's hamfest weekend, something for ARCI's 50th"

Without hesitation, Randy said, "Sounds great! If you want to do something this year-I'll help. And … We could also do some PoTA operating while we're up there, since Monte Sano State Park is PoTA # USAL001."

So, on short notice, we got to work. Somehow, we managed to round-up and herd 26 avid QRPers to Rustic Cabin #2 (Figure-1) in the Monte Sano State Park to partake in a Southern BBQ and to compete in an interactive QRP contest.

Figure-1—QRPers start arriving at the cabin.

We named this year's event An Evening of QRP on Monte Sano, Southern Style. And it was in this spirit that we gathered beneath the oak and sweet gum trees next to the (very) rustic cabin.

As you might expect-tales (some tall) were shared as copious amounts of the specially-ordered pulled-BBQ pork and smoked turkey dinner with all the fixin's was consumed.

Then, the gathering quieted down for a spell as they focused on savoring the deserts: Gibson BBQ Restaurant's fresh-baked Lemon Icebox and Chocolate pies topped with meringue plus authentic Southern pecan pies (topped with creamy vanilla bean ice cream by those who wanted the whole, unadulterated experience).

Our special guests Eric Swartz, WA6HHQ and his wife Lerma, KD6ANH of Elecraft quickly became part of this Southern QRP evening. And, as you would predict, the guys kept Eric (Figure-2) busy answering questions about the new KX3 and related support products coming out later this year.

Dinner conversations included a debate

Figure-2—Eric Discussing Elecraft's new KX3.

Figure 3—Feisty NoGAnaut Clan camping at Monte Sano.

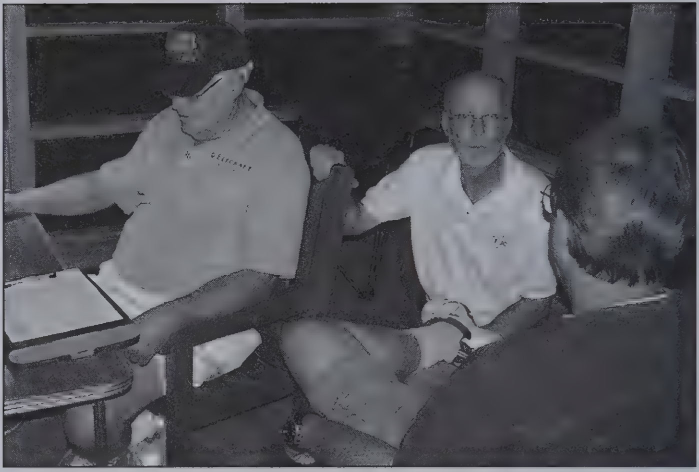


Figure 4—Team-1 chases DX multipliers.

by NoGAnauts (from the Atlanta area) who were staying in the Monte Sano campgrounds (Figure-3), as to whether the symphony the cicadas made lulled them to sleep, or kept them from sleep. Others shared personal adventures they experience around the world (with and without radios), including scuba diving. We enjoyed a time of great fellowship, a solace of escape on a balmy summer night, high on a favorite Alabama mountain.

As dinner concluded, we reviewed the "Flying High with QRP" contest rules and Eric-WA6HHQ was introduced as our judge. (Eric was well qualified and knew what to expect since also judged our Mystery Brown Bag Antenna Contest in our 2000 QRP Monte Sano event.)

This time, our contest had two teams, each with a stealth bomber pilot, a co-pilot and a navigator. Each team waged QRP war for a half hour, making as many CW contacts as they could. Each QSO counted one point which was then multiplied by big multipliers for each unique state, country and ARCI number they obtained. The pilot and co-pilot operated the Elecraft K3 Transceiver with the two RadioWavz antennas we hung high in the trees: a Windom and a G5RV (both on 80-meters and up).

From here, things get interesting since my contests, by design, require lots of non-standard team and audience interaction. Eric, WA6HHQ and Randy, KS4L stayed with each team to provide real-time assistance for technical issues and operational questions the teams needed to resolve. The navigator, on the other hand, could leave the operating area to find ways to boost his team's score. This included placing QRPSPOTS via Internet phones that audience members had at the event. They also borrowed another QRP transceiver with a BuddiPole antenna to operate as an independent station. They used this rig to scan all the bands so they could offer informed guidance to the pilot as to where he should operate, etc. They were also encouraged to exploit any "gray areas" in the contest rules, but they were not allowed to transmit themselves.

Team-1 was piloted by Jim Younce, K4ZM of Mobile, AL, Terry Young, K4KJP from Foley, AL, was Co-Pilot and Tom Dooley, K4TJD from Norcross, GA, was their Navigator.

Enterprising guys that they were (Figure 4)—They had discreetly checked the bands on the K3 just before dinner and discovered that 20-meters was open for DX. Since countries had the biggest multiplier, it was a "no-brainer." They set their strategy to seek-out countries as their first priorities. And … Their strategy looked good, at first.

Soapbox from Team #1:

"It's a crying shame that 20-meters died just as we started; Bands were noisy; Operating consisted of fighting mosquitoes and local QRM; Great test of Op skills and teamwork; Operating was interrupted by a daddy-longlegs crawling across the log; Lost time trying to work a CO2;" and, "Our navigator kept us on the contacts that were available."

Team-2 was piloted by Greg Lane, N4KGL from Panama City, FL, JP O'Connor, WF4Z from Marietta, GA was Co-Pilot, and Mike Fanning, K4GU from Huntsville, AL, was their Navigator.

When it was time for Team-2 to operate (Figure 5), they were well aware that propagation was marginal. So, they set a strategy to work as many states as they could. In addition, the Team-2 navigator also figured out that, while he was not allowed to transmit, the contest rules were open to getting others at the event to use the second QRP transceiver to add QSO's to his team's total.

Soapbox from Team #2:

"From a navigator's perspective, it was a lot of fun trying to figure out the rules while the contest was going on; Being in the screened porch of the rustic cabin was fun;" (and in view and earshot of all the spectators). "Light summer breezes, using a K3 and lots of great folks—how could you go wrong! Figuring out a strategy while operating was fun and interesting as well."

When the proverbial "smoke cleared" and the competition was over, Eric, WA6HHQ and Randy, KS4L met in the cabin privately to assess the logs. Eric applied the scoring formula and then called everyone inside the small cabin (standing room only) to hear his decision.

Eric said, "I've carefully reviewed your logs. I've run the numbers through the contest formula with Randy and I have determined a winner. As it turned out, this was a very close contest. Team-1 had more countries than Team-2, but Team-2 had more states and contacts. Our Flying High

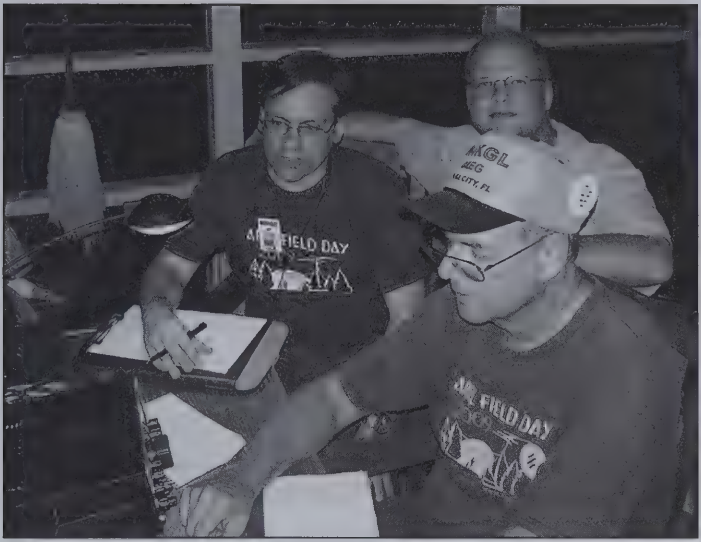


Figure 5—Team-2 decided to focus on states and maximum QSO quantity.

Figure-6—Greg-N4KGL enjoying his new TenTec 40/20 QRP Transceiver.

with QRP contest winner is Team-2 by a margin of only 10 points." Then, Eric made an additional comment, that he found it interesting that the Team-1 Pilot used the Vibroplex Iambic key, but the winning Team-2 Pilot chose to use the Vibroplex straight key.

After a small amount of discussion, the gang accepted Eric's decision and we started our drawing for the long awaited prizes. (The Huntsville Hamfest vendors were, as always, generous.) Prizes given to the contest teams and attendees included:

- A TenTec 40/20 QRP Transceiver (our grand prize—See Figure-6)
- Elecraft's new XG3 RF Signal Source
- A RadioWavz Antenna Gift Certificate
- A HamPlaques Gift Certificate
- A *CQ* Magazine Subscription
- A PowerPole car power adaptor from GigaParts
- Three AARL Mini-Logbooks and a 2-pack of BNC/259 connectors from GigaParts
- A Vibroplex tee shirt
- An 8-pack of Energizer 4X AA rechargeable batteries
- A set of 3 ropes on hand-winders for vertical antennas
- A Pack of 10 micro-bungie cords
- A Jar of mini-bungie cords

[Editorial Note: Elecraft, TenTec and HamPlaques also support us by placing paid ads in the *QRP Quarterly*.]

In closing, I again offer my thanks to all who made this QRP event so much fun. In addition, I offer a challenge for others to put up their QRP lightning rods and find new ways for us to share in the fun.

After all-It only takes a little spark to make significant things happen!

"So, Randy ... What kind of mischief can we create for next year's Huntsville Hamfest QRP Special Event?"

And to the rest of the QRP gang-I Hope to see Ya'll here having major fun with us at the Huntsville Hamfest 2012 QRP event next August!

—72, Craig, NM4T

●●

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While you're at it ... check out the QRP ARCI Toy Store for QRP clothing and accessories, past FDIM Proceedings, and other items to show your enthusiasm for the QRP side of ham radio!

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International Lighthouse Weekend

Dan Caesar—NI9Y

ni9y@arrl.net

Yaquina Head lighthouse.

Tisconia Park lighthouse grounds.

This annual amateur radio event was started in Scotland in 1995 by the late Mike Dalrymple (GM4SUC) and other members of Air Amateur Radio Group (AAR). Today the group is committed to the long-term ownership, development, administration and non-commercial operation of the event on behalf of the worldwide radio amateur community. Through its efforts in these areas AAR hopes to ensure that the ILL and Mike's dream (of a premier international goodwill event) shall continue for many years in a truly amateur environment. The fact that some 85 countries have been represented in this event since inception clearly shows that this goal has been well and truly achieved.

The event came into being from the Scottish Northern Lighthouses Award Weekend first held in 1994. To date more than 450 lighthouses and Lightships in some 50 countries around the world have participated in the event.

Purpose

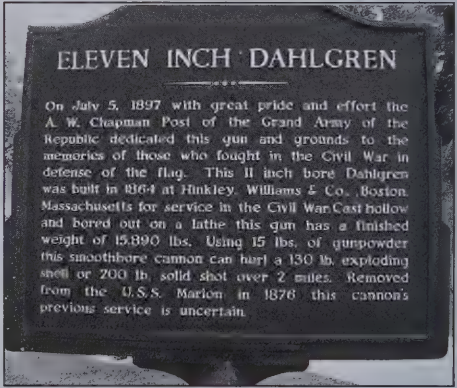
The basic objective of the event is to promote public awareness of lighthouses and lightships and their need for preservation and restoration, and at the same time to promote amateur radio and to foster International goodwill. Lighthouses are not as useful with the introduction of Global Positioning Systems and satellite navigation and the automation of the light source to solar power which has resulted in the withdrawal of management personnel (Keepers). It is hoped that this event will highlight this situation and help preserve these magnificent structures all around the world.

The Indiana Adventure Radio Group, NI9Y, WA9S, WD4MSM, KB9IVA and KC9PRJ, was able to "give" two lighthouse numbers to contacts (US0121 and US0122) because we were on the grounds of the two lighthouses—both the Inner and Outer North Pier Lights in St. Joseph, Michigan!

The weather was rainy driving up but cleared up for several hours giving us plenty of operating time. Then the sky darkened and big lightening strikes thundered overhead. We packed up in the nick of time before the heavy downpour. We all had a great time using batteries and portable antennas. The Ni9Y antenna was a Par-Electronics EFT-20 meter end-fed half-wave dipole. The rig was a Kenwood TS-50 and AT-50 auto tuner. WA9S Keith, and Barry, WD4MSM used their Buddy dipoles. WA9S operated his Hendricks PFR-3A, and WD4MSM had his ICOM-703 plus. Charles KC9PRJ used an Alinco DX-70 and LDG AT-100 Pro auto-tuner into a homebrew ham stick 40 meter dipole. Bob, KB9IVA, was on standby with his ICOM-703 Plus and CF Zepp Antenna. Many contacts were made despite the several non-lighthouse contests underway. 20 meters was the most popular band due to high atmospheric noise from the rolling thunderstorms hovering over the lighthouses.

Despite the severe thundershower the skies opened up for a two hours to give us a fun Saturday. Afterward we had lunch together and left for our QTHs in South Bend, Mishawaka, and Plymouth, Indiana. The next Adventure Radio event is the first

The Tisconia Park cannon. [*Gives new meaning to the term "Big Gun" —ed.*]



ELEVEN INCH DAHLGREN

On July 5, 1897 with great pride and effort the A. W. Chapman Post of the Grand Army of the Republic dedicated this gun and grounds to the memories of those who fought in the Civil War in defense of the flag. This 11 inch bore Dahlgren was built in 1864 at Hinkley, Williams & Co., Boston, Massachusetts for service in the Civil War. Cast hollow and bored out on a lathe this gun has a finished weight of 15,890 lbs. Using 15 lbs. of gunpowder this smoothbore cannon can hurl a 130 lb. exploding shell or 200 lb. solid shot over 2 miles. Removed from the U.S.S. Marion in 1876 this cannon's previous service is uncertain.

Plaque with the story of the cannon.

The Indiana Adventure Radio Group (left to right): NI9Y Dan, WD4MSM Barry, KC9PRJ Charles, and WA9S Keith.

This is how Dan, NI9Y packs for an Adventure Radio trip!

The KC9PRJ radio van (left) along with the rig setup (upper right) and view of the operating position (lower right).

Barry, WD4MSM at his operating position.

ever (INPOTA) Indiana Parks on the air September 10th, and in October, the annual Boy Scout Jamboree at Potato Creek State Park.

Our Adventure Radio Group was formed in 2008 and operated from Mishawaka Monkey Island, New York Central RR Museum in Elkhart, St. Joseph County Nature Preserve, and the Polar Bear events during January and February outside at Cobas Creek Park in Elkhart.

—Dan, NI9Y

●●

Keith, WA9S puts in some operating time.

The WA9S station equipment (bottom) and Buddipole antenna (top).

JABOM—A 17M SSB QRP Transceiver: Part 1

Pete Juliano—N6QW radioguy90@hotmail.com

So, what's a JABOM?

Well, having no other clever ideas to attract your attention I had to come up with an acronym that borders on the mystical. JABOM is nothing more than "Just A Bunch Of Modules!" Shameless, that's me. But, the title does accurately describe the idea used to build and connect a series of circuits that ultimately results in the successful construction of a 5 watt 17M SSB transceiver. Moreover, this article is aimed directly at those hams with little or no experience at homebrewing. You see, I enjoy homebrewing my own radio equipment, which predominantly includes QRP transceivers. Frequently when in a QSO I mention that I am using a homebrew QRP SSB transceiver, the response from the other end is that they would like to build something similar but simply don't know where to start. Well, that can be fixed; just read on. No advanced degrees in solid state physics or electrical engineering required. Heat up the soldering iron and let's get started!

Overview

Figure 1 shows an overhead view of the transceiver and Figure 2 shows the front panel in its final configuration with its controls and display. The transceiver has a footprint of 8 inches by 10 inches, which is quite large by comparison to most kit or commercial units, and even larger than the palm-sized SSB transceiver I described in the Summer 2011 issue of *QRP Quarterly*. However, the size fits our purpose and offers several benefits.

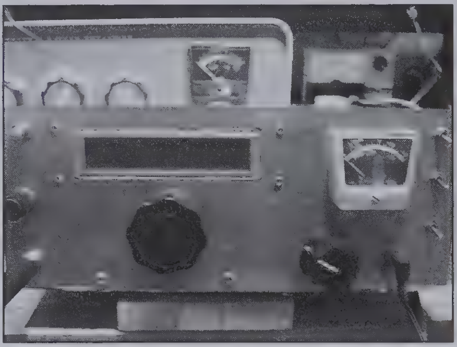


Figure 2—JABOM front panel.

First, JABOM is constructed module by module with each module being tested before proceeding to the next. This approach not only is a confidence builder but also resolves the issue of building everything at once only to find something is amiss. This way, a problem is isolated to a specific module, thus making problem resolution and/or repair much easier. The modules are also built in a sequence such that what has already been built becomes a part of the test circuit for modules yet to be constructed. The receiver modules are built first, resulting in a complete working receiver. Since some of the receiver modules are also used as transmitter stages, a large part of the transmitter is already constructed and known to be working before any of the transmitter-specific stages are built. This logical approach is but one more benchmark on the road to a successful project.

Second, the modules enable experimentation and augmentation of the transceiver. For example, you might want to add more bands or a more complex crystal filter for better performance. And if you find that your grand experiment didn't work out as expected, it takes only a few minutes to revert back to a working transceiver.

Of course, you will need a way to construct the boxes for these modules without doing serious damage to your wallet. The solution is an easy one. The copper boxes are hand built from double-sided copper PC board using nothing more than a pencil, a small square, a miter box and a hacksaw. This has proven to be a very efficient method. There are two variants, one which includes building a box around a piece of single sided copper vector board and the other on using just a piece of double sided copper board such as you would use for Manhattan style construction. For those needing a bit more instruction on the construction of these boxes, I have placed a tutorial on my website, www.jessystems.com/copperbox.html. Construction costs have also proved to be low. I purchased 3 pounds of double-sided copper board on eBay (more than enough) and the cost with shipping was $10. Need I also mention that the boxes provide excellent shielding and reduce or eliminate the possibility of circuit interactions.

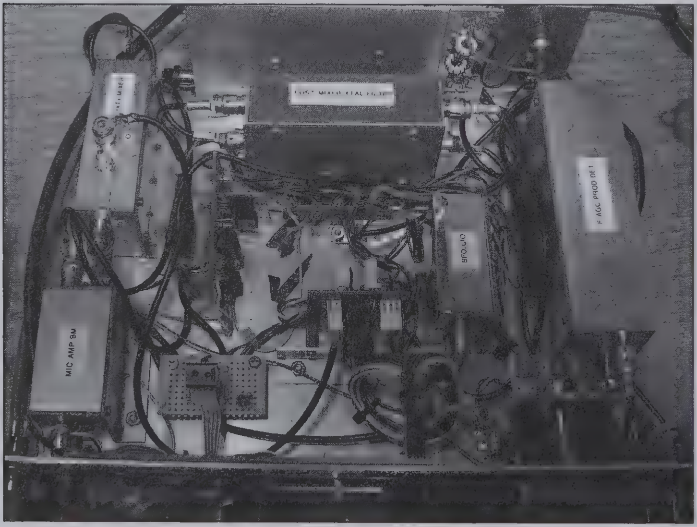


Figure 1—Top view into the completed transceiver.

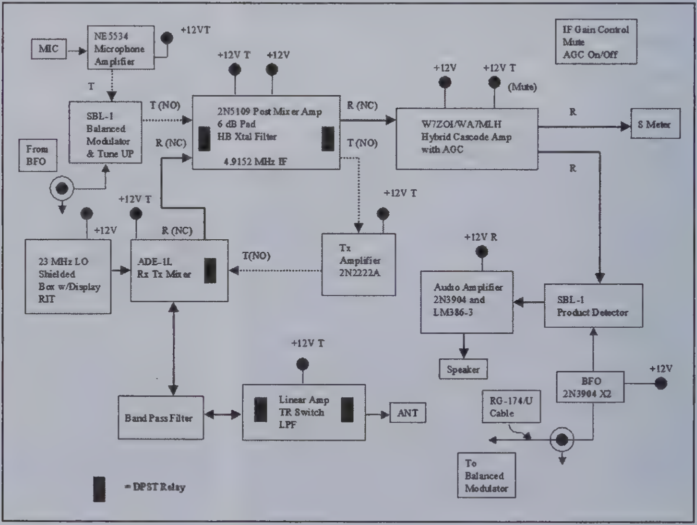


Figure 3—JABOM block diagram.

By the way, don't bother asking for printed circuit boards for this project as they don't exist. Rather, each module is built using one of two methods, either single-sided copper vector board or the copper square method a la Manhattan-style. This encourages experimentation and results in a rapid build sequence that does not require a board redesign when changes are made.

JABOM's overall design is shown in the block diagram of Figure 3. The design contains many of the same circuits that have been used in my previous *QRP Quarterly* articles and they are simply recycled for use on this project. Those circuits were selected because they are well proven and use standard parts. Many of my prior projects used a bilateral approach, in that the same circuits were used for both transmitting and receiving. JABOM has a few of those but for the most part many of the modules are independent and simply switched into the circuits depending on whether it is in receive or transmit. The major key element here is that their performance is known and documented.

The 17M Band was selected for this transceiver since it will give you a fighting chance over bands like 20M where many stations run a lot of power and large beams. There is plenty of DX on 17M and it is a less crowded band. The five-watt power level will fill your electronic log with many contacts. If you prefer 20M, design information for that band is included and the conversion involves minimal circuitry changes. In fact, the first use of the prototype transceiver was on July 9th during the IARU contest with the radio configured for 20M and running less than 5 watts. Imagine my surprise when JX5O on Jan Mayen Island called QRZ and responded to my call sign. That is a 4500-mile hop from my QTH near Seattle, Washington. I was not the only station calling and my QRP signal was heard! This is a serious radio, which can be built by you!

With a few changes, it is also possible to operate the same basic radio on the 20M, 17M, 15M, 12M and 10M bands. With a single conversion design the only modules, aside from a change in the LO frequency, required for multi-band operation are a bank of Band Pass Filters (BPF's) for each band and similarly a series of Low Pass Filters (LPF's) on the output stage. Band switching can be done with small DC-operated PC style relays. For an example, see a similar project on my website at http://www.jessystems.com/2009_XCVR.html.

The single conversion design uses an IF frequency at 4.9152 MHz and a Local Oscillator (LO) at 23 MHz, above the IF and operating frequency. This has advantages of eliminating unwanted mixing components. The sideband signal is generated as LSB in order to favor the characteristics of the simple crystal filter used. The subtractive mix of the LO and IF reverses the generated LSB signal resulting in USB, which of course is the normal mode of operation for 20M and above. The 4.9152 MHz IF works well for use on the 17M band as well as in a multi-band scheme.

There are two ways of providing the local oscillator signal in this radio, both of which are explained in this article. The first and cheapest way is with a Super VXO using inexpensive computer crystals, as was done with the 40M CW transceiver shown in the Spring 2011 and Summer 2011 issues of *QRP Quarterly*. I suggest constructing the VXO in order to get the radio working and making contacts while keeping the costs low. Band coverage is limited to about 30 kHz, but that is sufficient to make some contacts and may even be sufficient for your needs. If you wish full coverage of the 17M band with the possibility of later expansion to multiple bands, you could swap the VXO module for a K5BCQ Si570 frequency generator kit (http://www.qsl.net/k5bcq/Kits/Kits.html) costing about $50. I explain how to make the switch to this kit in a sidebar to this article.

Even though much of the circuitry is recycled from my previous projects, there are some new features as well.

One new feature is a real AGC (Automatic Gain Control) circuit that works very well. The Hybrid Cascode IF amplifier and AGC appeared in December 2007 *QST* and are a direct lift from the works of W7ZOI, Wes and WA7MLH, Jeff. For a little embellishment I added an S Meter and adjusted the time constant so that the AGC is fast attack and slower decay than in the original article. This AGC is IF-derived and as such avoids the "popping" sounds one gets when the AGC is audio-derived. The circuit IS capable of a 100 dB gain reduction and there is functionality to defeat the AGC as well as mute the radio. This is done with two panel mounted switches.

There is only one word to describe the IF and AGC action and that is "Stunning"! I made several tests of listening to very strong signals with the AGC in the OFF mode and the signals were very loud and distorted! Turn on the AGC and the gain level was reduced to a level that gave an absolutely excellent copy signal. Weak signals simply pass through the circuitry without any attenuation.

Something else new is the extensive use of small board mounted relays to route signals during the change over from transmit to receive. Referring back to Figure 3, look at the post mixer amplifier, crystal filter and transmit RF amplifier module. This module uses two 12 VDC DPST signal relays. In the receive mode the NC (normally closed contacts) route the signal from the mixer stage to the post mixer amplifier through the 6 dB pad on to the four pole crystal filter. From here the signal proceeds on to the NC closed contacts of a second signal relay and from there to the Hybrid Cascode IF, AGC and Product Detector module. In the transmit mode, signals are routed from the Microphone Amplifier/ Balanced Modulator module to the NO contacts, which are now closed. This signal now connects to the post mixer amplifier, 6 dB pad and crystal filter but in this case the signal is routed to the NO contacts of the second signal relay. The NO contacts are now connected to the transmit RF amplifier, a 2N2222A with heatsink. The output during transmit from this stage is now routed back to the mixer stage. A small relay in the Mixer stage module routes the signals in and out of the Mixer stage. A gain pot in the 2N2222A stage enables adjusting the overall gain of the transmit signal. This is a very desirable feature if the transceiver were to be cranked down to QRPppp levels or for driving an external linear amplifier that may require something less than 5 watts for full output.

A third new feature is a relay in the Balanced Modulator Microphone Amplifier Module which unbalances the SBL-1 for tune up purposes. A panel mounted "Tune" switch engages this relay, which simultaneously trips the PTT, thereby generating a carrier signal and placing

Step	Module	Comment
1	Test Oscillator & RF Probe	See Appendix 1
2	Beat Frequency Oscillator	On at all times. Test with RF Probe
3	Audio Amplifier	Powered on only in Receive
4	Hybrid Cascode IF Amplifier/AGC	Muted in Transmit Mode. Test with Oscillator
5	S Meter Circuit Module	Powered on only in Receive Mode.
6	Post Mixer Amp, Xtal Filter, Tx RF	Relay Signal Steering. Test with Oscillator
7	LO Module	Test with RF Probe for signal
8	Receive & Transmit Mixer	On at all times. Test with an antenna.
9	TR Power Switch	On at all times
10	Balanced Modulator Microphone Amp	Test with Audio Amp. Test with RF Probe
11	Low Level Transmit Linear Amp	Test with RF Probe
12	Final RF Power Amplifier Stage	Test with a Dummy Load & RF Probe

Table 1—Construction steps to build the JABOM 17M SSB rig.

the radio in the transmit mode. This beats whistling into the microphone or shouting "Hola" to put out a signal. There is also a 100-ohm trimmer connected across two arms of the SBL-1 so that a manual carrier balance can be effected. The use of this trimmer is documented in *EMRFD* (Figure 6.101) courtesy of W6JFR (now N6QW) and also a part of the carrier unbalance scheme for tune up purposes.

Now a word about overall gain distribution in the circuit as virtually all of the gain is after the first mixer stage and there is no RF amplifier. None is needed! I have heard a lot of DX and the weak signals are heard! The Hybrid Cascode IF amplifier provides over 50 dB of gain and is the heart of making this an excellent receiver. For the Receiver and Transmit mixer stage, I chose the ADE1-L as it is a 3 dBm device requiring less LO drive and has a smaller conversion loss. The audio amplifier stages provide plenty of room-filling loud speaker volume.

Finally, with but a few exceptions all interfaces are 50 ohms which lends itself to RCA connectors and short lengths of RG-174U coaxial cable.

Let's Start the Building!

To facilitate the construction of the radio and to provide a roadmap the following is a guide to the order and sequence of module construction. Parts lists and suppliers are available on my website.

Look at Table 1. You will notice that the first step is construction of a Test Oscillator and RF Probe. These are the same test instruments used in my previous article on the 40M CW transceiver and need not be reconstructed if you built that transceiver. If you have not yet built the instruments, you can obtain the information to do so in the Spring 2011 issue of *QRP Quarterly* or at http://www.jessystems.com/Images/40M%20Article%20Photos/Appendix%20I.jpg. These are fundamental pieces of test hardware that will be used throughout the project.

Before proceeding to build the first module in the transceiver, we first want to consider the 4.9152 MHz crystals used in the homebrew filter, the Beat Frequency Oscillator and Test Oscillator. It is best to procure at least ten individual crystals and twenty is even better. The reason for this is that we need to find a minimum of four out of the batch of crystals that are within 50 Hertz of each other for use in the crystal filter. This is another reason why the Test Oscillator is built first as it offers a convenient means of finding four crystals close in frequency. One might consider adding a socket to the Test Oscillator for the purpose of cycling the crystals through the oscillator or even the addition of some alligator clips that are soldered to the Test Oscillator board. Because I am frequently sorting crystals I have built a test oscillator specifically for that purpose and it has a socket. Once the trimmer has been set on the Test Oscillator do not change its setting as the objective is to find the relative frequency spread of the batch of crystals.

There are many ways to find the magic four. One is to have a frequency counter coupled to the Test Oscillator and then the exact frequency of each crystal can be measured. Another is to have a general coverage receiver tuned to the output frequency of the test oscillator and note the relative pitch of the received signal as to whether it is high or low. The RIT function on the receiver is a great aid in this approach. Using felt tipped marking pens I usually start by numbering the crystals in sequence (i.e. 1, 2, 3 etc.) and then note its relative position such as higher or lower in frequency by simply making piles of crystals. It is surprising how accurate the ear can be in determining the four that are close. After finding the four crystals for the filter, look for two crystals that are at the

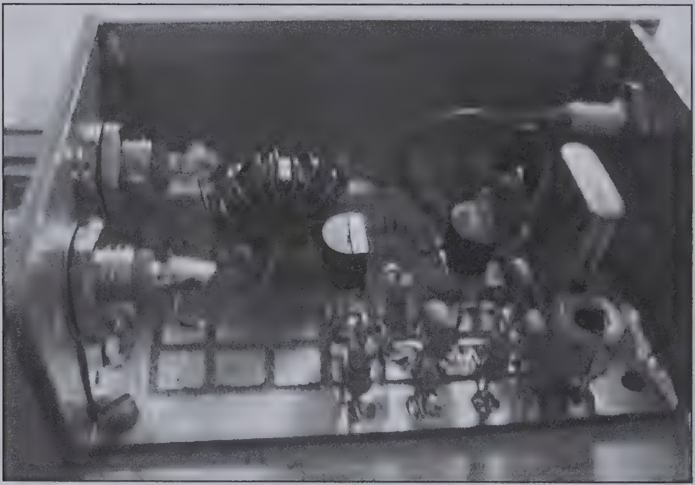


Figure 4—BFO/CIO module.

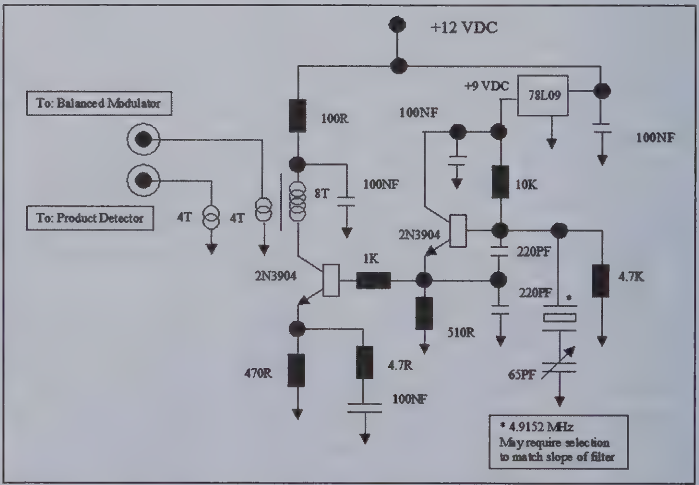


Figure 5—BFO/CIO schematic diagram.

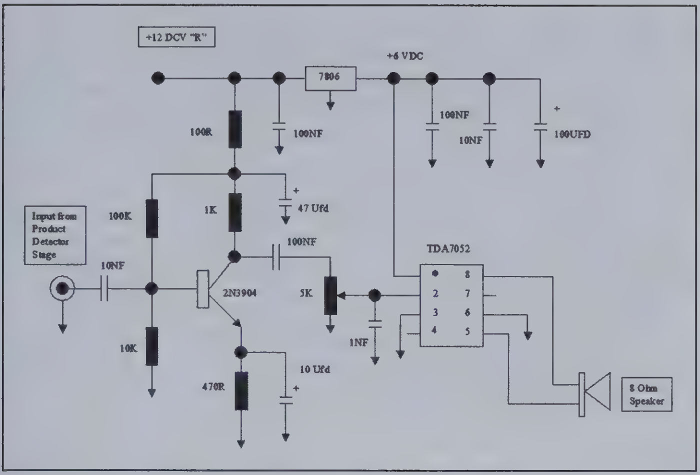
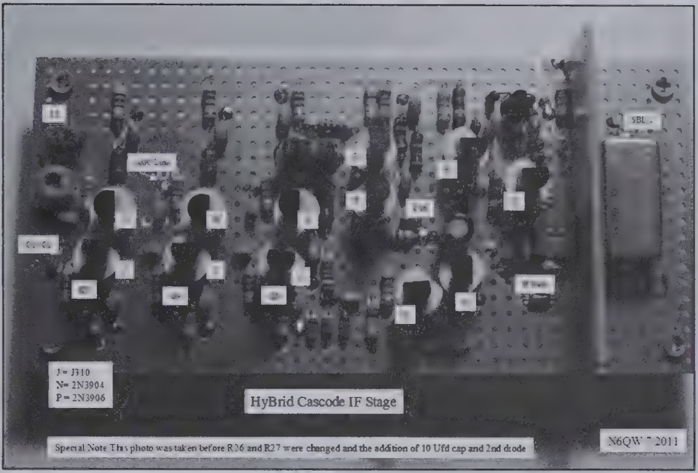


Figure 6—Audio Amplifier schematic.


SBL
J= J310
N= 2N3904
P= 2N3906
HyBrid Cascode IF Stage
Special Note This photo was taken before R26 and R27 were changed and the addition of 10 Ufd cap and 2nd diode
N6QW 7 2011

b e **Figure 8a—Top side of the Hybrid Cascode IF Amplifier.**
fed

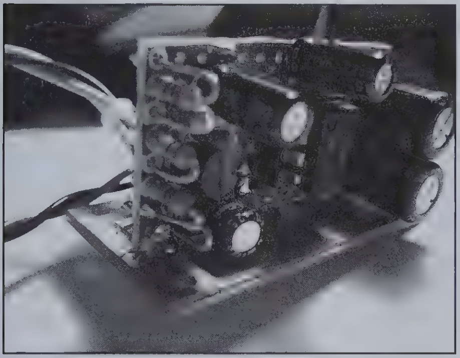


Figure 7—Audio Amplifier photo.

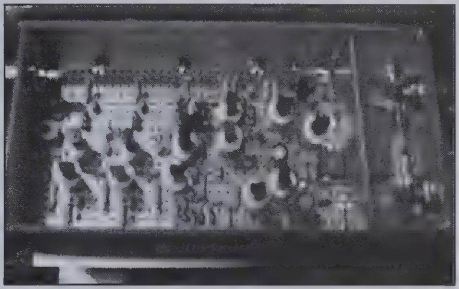


Figure 8b—Hybrid Cascode IF Amplifier as installed. Note the shielding of the mixer on the right.

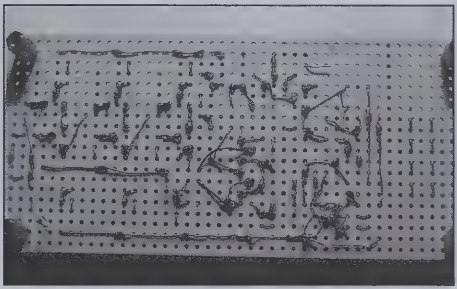


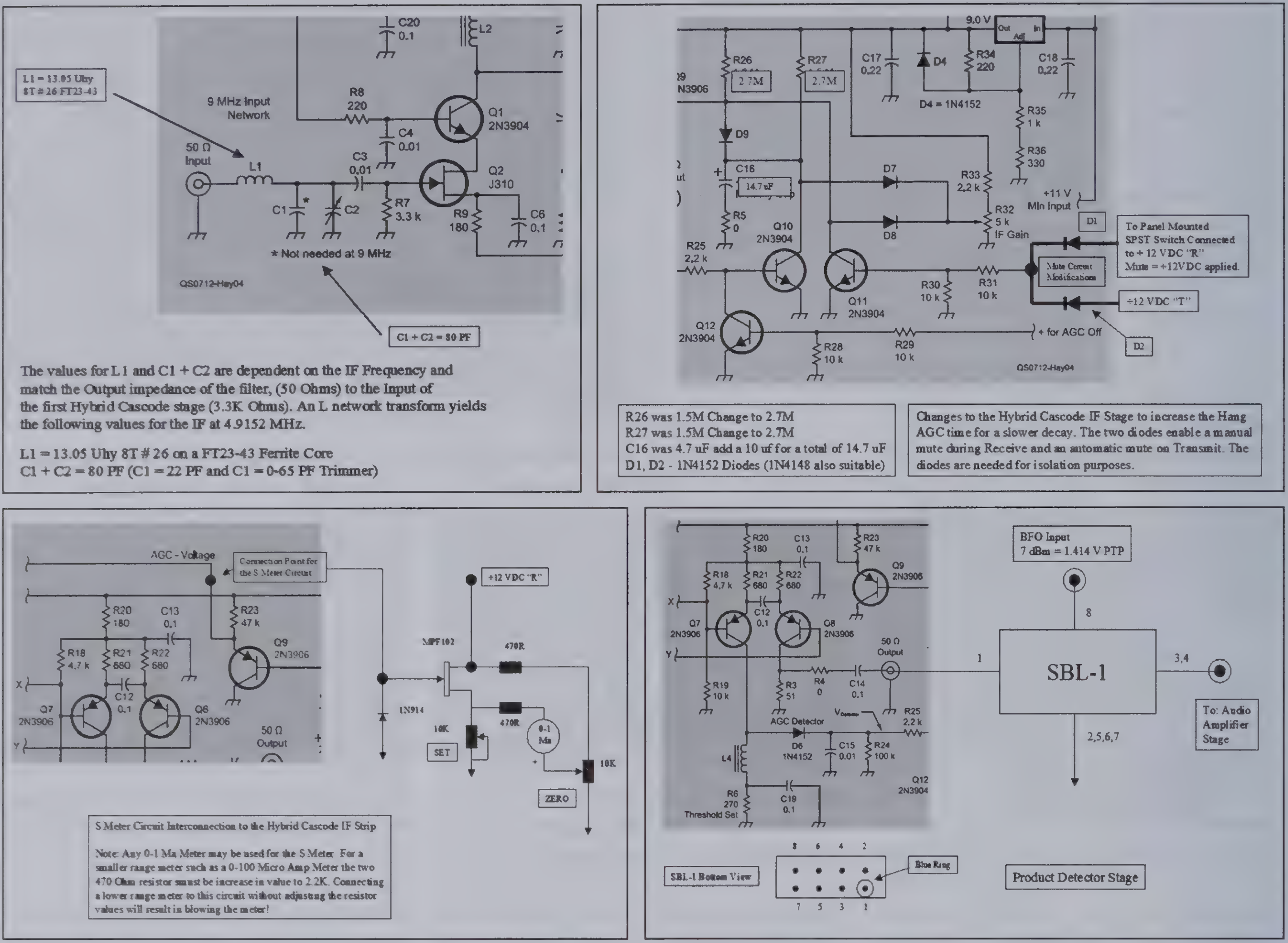
Figure 9—Bottom side wiring of the Hybrid Cascode IF Amplifier (Hycas).

extreme ends of the frequency spread as these can be used for the Test Oscillator and BFO. Trimmer caps in the BFO and Test Oscillator are used to set their final frequency.

Next we'll build the BFO and it is also a circuit I have used in many of my other projects. Figure 4 shows the BFO Module and Figure 5 is the schematic. The SBL-1's in the Balanced Modulator and Product Detector are +7 dBm devices, which means that 1.414 volts peak-to-peak of RF energy is required to drive these devices and that is available with this circuit. The only difference from previous projects is that the output circuit is comprised of two windings, one of which is connected to the Product Detector and the other to the Balanced Modulator. For the secondary, I simply twisted the two wires together, threaded them through the core in the same direction as the primary winding. At the end away from the collector, connect the windings together and solder them to ground. The other two ends closest to the collector are now phased properly and can individually to the RCA connectors.

The BFO is built using the island square method on a piece of double-sided circuit board that is approximately 1 x 2 inches. In each corner of the board, a 1/8-inch hole is drilled to facilitate mounting of the circuit on a board for intermediate testing. Once built, check all your wiring for correct parts and no shorts. Up to this point, the copper box has not been built around the circuit and power is temporarily connected to the board. If you are confident that all is well power up the circuit and use the RF Probe to check for an output. If none results, check the wiring and look for any errors. Once it is operating build the copper box around the board and install the feed through capacitor and the RCA connectors. Finally, make a piece of circuit board that is as long as the box but only about 1/2 inch across. This piece will be soldered perpendicular to the longer side of the box to form an L bracket for mounting in a final configuration. See the Mic Amp/BM module in Figure 1 for an example. Power up the board and assure yourself that it is still operating. Later on when you have finished the transceiver, you will construct a cover for the box using a piece of thin tin plate available at a local hardware store. The plate should have a 3/16 inch hole over the trimmer cap for final tuning after the cover is installed by tack-soldering it to the copper box.

We next will build the audio amplifier stages and again these circuits have been used in many of my previous projects. At the suggestion of one of the *QQ* editors, I was asked to investigate the use of the TD7052 IC as a final audio amplifier stage as it appears that sadly the LM386 may be headed toward obsolescence. That investigation was not successful and destroyed several of the TD7052 chips even though I followed circuitry suggested by the IC maker. So the attempt was abandoned and I returned to the LM386! Figure 6 is the schematic for the audio amplifier stage. The construction of this module was done using the single sided copper board, which in turn was soldered to a perpendicular base plate made of the double-sided board. Holes are drilled in each corner of the base



The values for L1 and C1 + C2 are dependent on the IF Frequency and match the Output impedance of the filter, (50 Ohms) to the Input of the first Hybrid Cascode stage (3.3K Ohms). An L network transform yields the following values for the IF at 4.9152 MHz.

L1 = 13.05 Uhy 8T # 26 on a FT23-43 Ferrite Core
C1 + C2 = 80 PF (C1 = 22 PF and C1 = 0-65 PF Trimmer)

R26 was 1.5M Change to 2.7M
R27 was 1.5M Change to 2.7M
C16 was 4.7 uF add a 10 uf for a total of 14.7 uF
D1, D2 - 1N4152 Diodes (1N4148 also suitable)

Changes to the Hybrid Cascode IF Stage to increase the Hang AGC time for a slower decay. The two diodes enable a manual mute during Receive and an automatic mute on Transmit. The diodes are needed for isolation purposes.

To Panel Mounted SPST Switch Connected to + 12 VDC "R" Mute = +12VDC applied.

S Meter Circuit Interconnection to the Hybrid Cascode IF Strip

Note: Any 0-1 Ma Meter may be used for the S Meter For a smaller range meter such as a 0-100 Micro Amp Meter the two 470 Ohm resistor must be increase in value to 2.2K. Connecting a lower range meter to this circuit without adjusting the resistor values will result in blowing the meter!

Figure 10—IF Amplifier changes (top left & right), plus S-Meter (bottom left) and Product Detector (bottom right) circuits.

plate so that it could be mounted to the chassis base plate. See Figure 7 for the finished stage. It is not necessary to build a copper box around the audio amp stage. In the final installation, this stage is placed close to the front panel to minimize the lead length to the volume control. I twisted three wires together to interconnect the volume control with the audio stage to minimize signal pickup.

Before powering on the audio stage, check for correct components and wiring errors and solder bridges. Once that is done, connect a small 8 ohm speaker to the output and power on the circuit. An audible sound should come from the speaker and touching the center wiper on the volume control pot should emit a very audible hum. Check to see if you have wired up the volume control so that as you advance the control clockwise the audio level increases. If not, swap the two outer wires at the control. Note that the audio amplifier stages are only powered "on" during Receive.

The next module to be built is the Hybrid Cascode IF Amplifier, Automatic Gain Control (AGC) and Product Detector. Figure 8a shows the top of this module and Figure 9 shows the bottom side of the board. Figure 8b shows the module in its copper box. Note the shield separating the Product Detector from the rest of the assembly. Purpose of the shield is to prevent any leakage of the BFO into the IF and AGC stages. The single board used for this stage is 4.5 by 2 inches. The Product Detector area is 1 inch long by 2 inches wide. The IF amplifier stage and Product Detector module is positioned directly behind the audio stage so that the output leads of this stage are but a short distance to the input stage of the audio amplifier.

This module is perhaps the most complex in terms of parts count and number of interconnects. Study Figures 8 and 9 very carefully, as a good deal of time was spent in optimizing this layout. Take your time building this stage as it affords many opportunities for errors. I suggest that you begin building the module by placing all of the components on the board, copying the placement of Figure 8 to assure the best parts fit and minimize wiring crossovers. Check the component values and insure the diodes are placed properly in the circuit.

The schematic for the Hybrid Cascode IF amp and AGC was downloaded from the KA7EXM website, http://www.ka7exm.net/hycas/hycas_200712_qst.pdf. The schematic is not repeated in this article for copyright reasons. However, in Figure 10 the changes and additions to the circuit are shown. Component labels (L1, Q11, etc.) refer to the labels used in the original article.

Figure 10a shows the changes necessary to the "L" matching network shown at the IF signal input in the original article. This network matches the 50-ohm input to the 3.3 kohm impedance at the base of Q2. The changes are required because the original article contemplated a 9 MHz operating frequency, not the 4.9152 MHz we use here. A trip to the Internet provided a simple L Network component calculator which results for an operating frequency of 4.9152 MHz of L1 = 13.05 µH and the C1+ C2 combination equal to 80 pF. Using tables supplied by Amidon, 13.05 µhy is achieved by winding 8 Turns of #26 on a FT23-43 core. For the 80pF, I used a 65 pF trimmer in parallel with a 27 pF fixed capacitor.

Figure 10b shows changes necessary to lengthen the slow decay time constant in the AGC. The constants provided in the original article are probably good for CW but too fast for SSB so new constants were empirically determined to suit my listening tastes. This required changing R26 and R27, shown on the original schematic as 1.5M, to 2.7M and paralleling a 10 µFd capacitor with C16 the 4.7 µFd memory capacitor. Figure 10b also shows the addition of two 1N4152 diodes in the Mute circuit. The purpose of these diodes is to provide isolation and the diodes operate as follows. If one desires to manually mute the radio, +12 VDC is applied to the 2N3904 switch (Q11 in the original article), and is connected as shown in the schematic to the 10k resistor. This diode enables feeding +12 VDC only to the IF and not any other circuits. But I also want to be able to mute the radio on Transmit. Thus a second diode is connected to the 10k resistor near the diodes and prevents the manual mute from being back fed in the transmit mode.

Figure 10c is the schematic for the S-Meter and is shown being connected to the AGC line (collector of Q9). I have not shown a part number for this meter on my parts list because there are few meters on the market with an S-meter face. Rather, I suggest you haunt the hamfests in your area and find an old meter that works. Any 0-1 mA meter will be suitable. Alternatively, you may be able to find a meter that can easily be taken from its case and design a new face for the meter on your computer. My meter came from an old Galaxy V transceiver. Anyone remember those rigs from the 1960's? The builder may still want to build the S-Meter module at this time and use a temporary meter, as it will offer a visual indication of the module tests. Don't cut the hole for the meter in your front panel until you find the actual meter you will be installing permanently in your transceiver. Rather, make a temporary electrical connection to the collector of Q9 while performing your tests. Note that the S meter is only powered on during Receive. I built the S-Meter circuit on a scrap piece of single sided copper vector board which was soldered to a piece of double sided copper PC board. I prepared the double-sided board in a manner so that two isolated pads were created on both sides of the board. The spacing of the pads was so that I could drill holes with the pads that aligned with the S-Meter terminals. The S Meter Module is simply affixed to the terminals on the S Meter and wire jumpers are soldered to the pads and then to the S Meter electronics. I arranged it so the two adjusting trimmers are easily accessible directly behind the S Meter. Not an original idea but certainly works well. Those of you who have read my previous *QQ* articles know I am prone to using any good idea. You can see the module and its placement at the lower right corner of Figure 1.

Finally, Figure 10d shows the connections and SBL-1 pin numbers needed for the Product Detector.

A special note here for those who, like me, frequently smoke parts. (Remember the TDA7052's). For the S meter, I used a MPF102 as a substitute for the 2N5484 that was specified in the article I found on the Internet. This FET is the device that operates the S Meter circuit, but I found that I could not pin the meter with a very strong signal. So I tried a different FET but its pin out unknowing to me was different than the MPF102. Immediately when I put the other FET in the circuit, the receiver went dead! Oh Oh! I broke my receiver. Well based on my previous experience other circuits that used 2N3906's, any sort of short to ground blows the device. So I immediately looked at Q9 and after replacing that device—all is well! So have a few spare 2N3906's!

Once you have completed this module, take a short break and then return to check your wiring before proceeding to the testing of these module.

The test of the above circuitry involves: 1) connecting the audio amplifier stage to the output of the product detector, 2) connecting the BFO to the Product Detector and 3) injecting a signal into the input side of the Product Detector to insure it is working. Finally step 4) checks the Hybrid Cascode and AGC stage. You will also want to temporarily hook the Mute and AGC On/Off switches to this module. Normally I connect +12 VDC to the fixed contact of the SPST switch and the switched contact is connected to the circuit. Insure these switches are in the "Off" mode before beginning the test. Temporarily connect a wire from the AGC line to the input side of the S Meter.

Dig out that Test Oscillator, power it on and check to see that there is output using the RF Probe. This Test Oscillator will act as a signal source for the tests of this module. Power on the BFO and check for output with the probe. Then, power on the Audio Amplifier stages and listen for output. Without power connected to the Hybrid Cascode IF and AGC module, bring the signal lead from the Test Oscillator near pin 1 on the Product Detector SBL-1. This is the RF input pin. You should hear a tone emanating from the speaker. Adjustment of the trimmer on the test oscillator may be required, but a tone should be heard at some setting. Adjustment of the crystal trimmer in the BFO may also be required in order to get an audible signal. This test will validate that the product detector is connected properly and is working.

Before applying power to the Hybrid Cascode Stage this would be an excellent time to verify that all of the sockets contain the correct devices. This stage uses multiple devices of J310's, 2N3904's and 2N3906's and it is very common to have the right device in the wrong socket! Take another look at Figure 8 and look for the letters J, N and P as this identifies J as the J310, N as the 2N3904 and P as the 2N3906.

Once you have verified that the devices are correct you can now begin the testing of the IF. The theory of this test is that our Test Oscillator will be used to supply a signal to each of the individual stages in the IF and working backward, starting with the stage that outputs to the Product Detector and working toward the input stage. Now this is where some common sense needs to

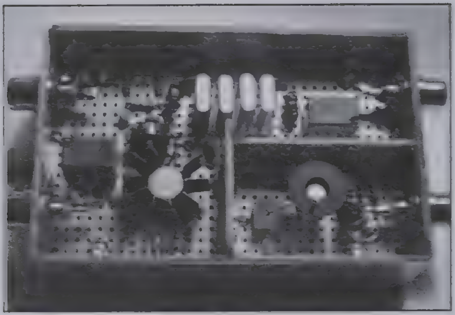


Figure 11—Post Mixer Amplifier, Pad and Crystal Filter Module.

be applied. It would be best to start with the AGC off and this is done by temporarily applying +12 VDC to the point on the diagram shown as R29. The next step involves setting the manual gain control. Start by setting the R32 trim potentiometer in the middle of its range.

Power on the Test Oscillator and assure that it is working. Next power on the following circuits: Audio Amplifier, BFO, Hybrid Cascode IF Amp and +12 VDC to R29 to turn off the AGC. Bring the test lead from the oscillator near the Gate of Q6 and listen for an output in the speaker. If that test fails look at Q5, Q6, Q7 and Q8 to make sure they are the correct devices and that power is supplied to this part of the circuit. Check for shorts, solder bridges and the obvious wrong connections. Once this stage is working rotate R32 through its range to verify the manual gain control. Leave it set for maximum gain.

Now bring the test lead near the Gate of Q4 and repeat the same test to listen for an output. In this phase of the test, if the stage is not working then the problem lies with Q3 and Q4. Use the same approach to verify the devices, that power is applied and that there are no wrong components or shorts. Assuming this passes the test, then bring the test lead near the Gate on Q2 and repeat the same procedure. When this stage passes, you know have a working IF strip.

Next we want to check the AGC circuit. Start by removing the voltage from R29 and bringing the test lead near the gate of Q2. The AGC action is now operational. If you hear a signal, reapply the +12 VDC to R29. The signal should be very loud with the +12 VDC applied and diminish significantly when the voltage is removed. With the AGC on (12 V removed from R29), run the 5k trimmer through its range and verify the changes in gain level. Once you have verified that gain levels change, leave the trimmer set for maximum gain. Once this module is connected to the Crystal Filter module, C2 can be tuned for maximum signal. If the S meter was built at the same time, zero the meter and you can observe the test process as you bring the test oscillator near the gate of each stage. Pretty cool! Next temporarily wire up + 12 VDC to R31 through one of the two 1N4152 Diodes. Upon application of power, the IF Stage mutes and no signal will be heard from the Test Oscillator coming through to the speaker. If the S Meter is connected, it will swing to the far right. On Transmit, +12 VDC is applied to the Mute port via the second diode.

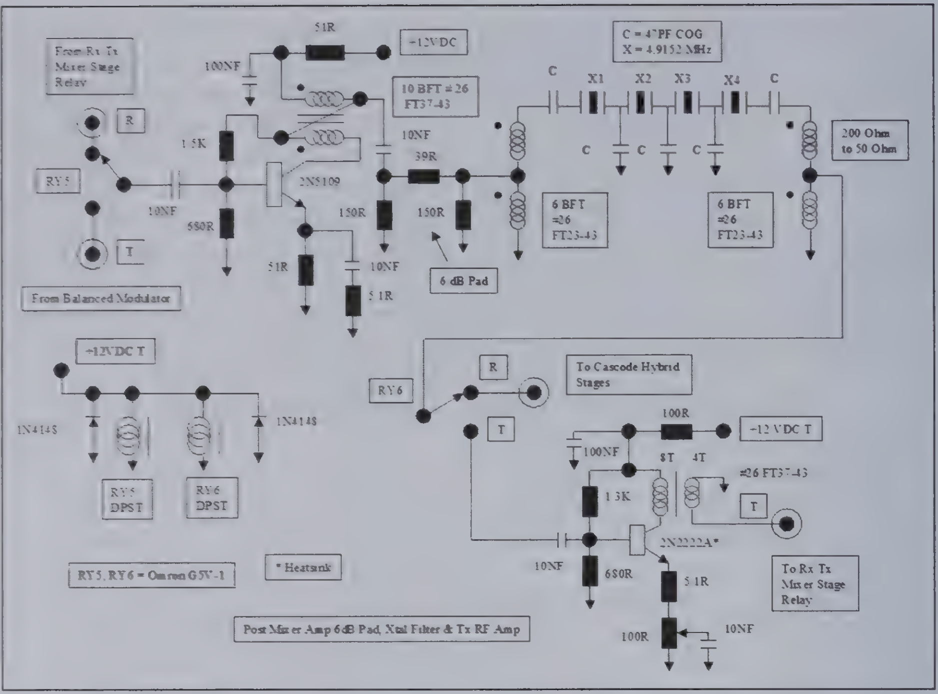


Figure 12—Post Mixer Amplifier, 6 dB Pad and Crystal Filter schematic.

The next most complex module, shown in Figure 11, is the Post Mixer Amplifier, the 6 dB pad, the homebrew crystal filter and the Transmit RF amplifier stage. This module is called complex only because it involves a significant amount of parts. An internal box is built inside the module box to further shield the Transmit RF amplifier stage from the Post Mixer Amplifier. Feedback is always a concern in high gain stages and thus nothing was left to chance. This circuit was a first for me and an original idea of mine—something that doesn't happen very often to me, but when it does I should take credit so others can steal from me. I saw it as a way to route the received and transmitted signal through the crystal filter. It has worked flawlessly and the two small SPDT 12 VDC signal relays are doing all of the heavy lifting. Figure 12 is the schematic for this module. Readers of *QRP Quarterly* may note that two stages of the Hybrid Cascode IF stage, the Post Mixer Amplifier, 6 dB Pad and a similar crystal filter were used in my 40M QRP CW Transceiver which appeared in the Spring and Summer 2011 editions of *QQ*. As was indicated at the outset, many of the circuits were simply recycled for this project. The "gotcha's" here are the improper wiring of the signal relays. On Receive, the NC contacts provide a signal path through the Post Mixer Amplifier, the 6 dB Pad, the Crystal Filter and finally to the Hybrid Cascode IF stage. On Transmit, the output of the Balanced Modulator is routed to the NO contacts of one of the two signal relays to the Post Mixer Amplifier, onto the 6 dB Pad through the Crystal Filter and through the NO contacts to the Transmit RF amplifier stage.

Once the module is completed, check all the wiring for shorts and make sure the relays have been connected correctly. The test of this stage consists of two parts. Begin by interconnecting this module to the Hybrid Cascode IF stage. For all of the interconnections I used about 8 inches of RG174-U with RCA connectors on each

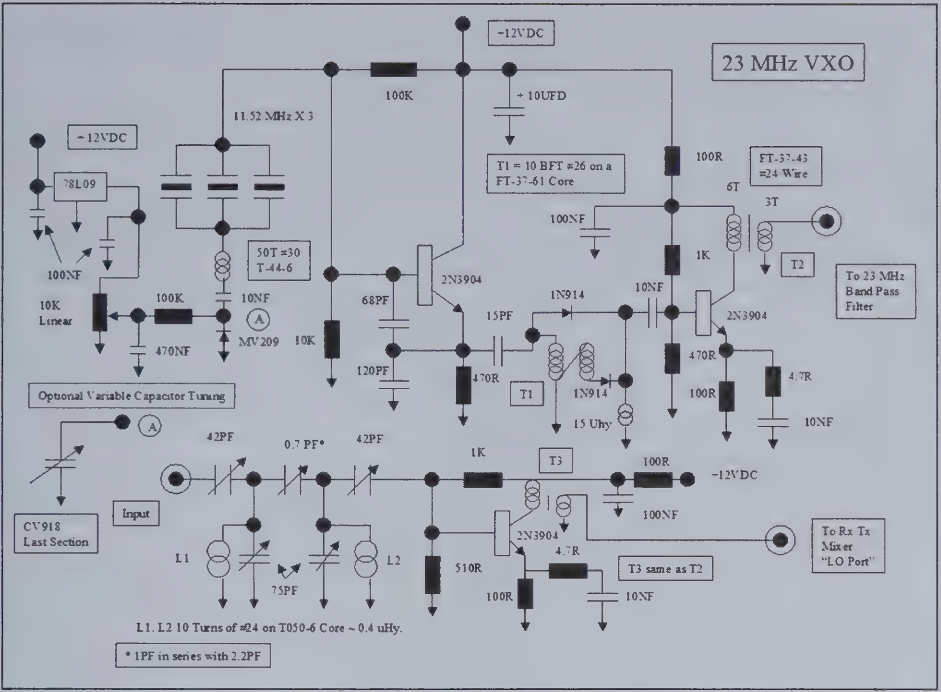


Figure 13—Schematic of the 23 MHx VXO.

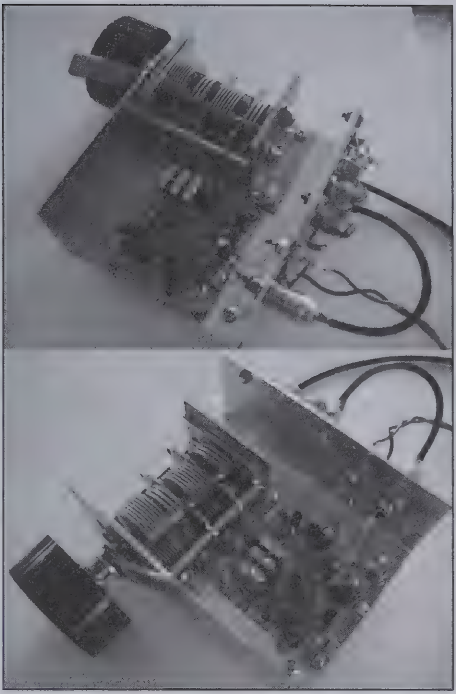


Figure 13—Photos of the VXO.

end. Power all of the completed stages and the Test Oscillator. Connect a short piece of wire to the Test Oscillator output and place the other end near the RCA connector on the input side that is connected to the NC contacts of the signal relay. A signal should be heard in the loud speaker. There are no adjustments on this module in the receive mode. Should there be a problem, look for the usual suspects, such as no power on the collector of the 2N5109, bad solder joints, solder bridges or that the relays have been wired improperly. Once the signal is heard passing through this stage we are really getting close to having a completed receiver. Note again how we are using the receiver itself as a part of the test and alignment of the transceiver.

Now we will test the Transmit mode of this module. When +12V "T" is applied to this stage, the two relays are engaged thus rerouting the signals in and out of the module as well as powering the 2N2222A. Set the potentiometer in the 2N2222A emitter lead about midway in its range and temporarily tack a 50-ohm resistor at the point marked "To Rx Tx Mixer Stage Relay" on the schematic. Apply 12 VDC at the point marked "+12 VDC" on the schematic and insure that this voltage exists on the 2N2222A collector. Now apply 12 VDC to the +12 VDC "T" line. Inject the Test Oscillator signal into the RCA connector that would normally connect to the Balanced Modulator and on the 50-ohm resistor connect the RF Probe that was built early on. You should see an output. If no output check, the Transmit RF amplifier stage for wiring errors, solder bridges and that power is applied to the collector of the 2N2222A. Once output is detected then adjust the gain pot for maximum output. Testing is now complete for this stage.

Now we will tackle the task of building the Super VXO used as the initial, low cost version of our LO. In a sidebar to this article, we will later explain how to convert to a more expensive but also more wide ranging and useful digital frequency synthesizer. To get the desired output in the 23 MHz range in our VXO, I started with inexpensive 11.52 MHz computer crystals to power a local oscillator, doubled the output to 23.4 MHz, passed the output through a bandpass filter to clean things up and finished with a single stage 2N3904 RF amplifier to drive the Rx Tx Mixer. While this scheme sounds relatively simple, I will admit that the design of this module gave me the most fits and starts, mostly related to a tug of war between wider frequency excursions and signal cleanliness. However, this final configuration is a solid varactor-based design which produces a clean signal with about 30 kHz excursion within the SSB portion of 17M. You may also substitute a variable capacitor for the varactor, but if you do so be sure to limit the maximum capacitance of the variable capacitor to about 35 kHz or less. A larger maximum value may give you problems and/or land you outside the SSB portion of the band. There is no value at getting at crossed swords with the FCC for out of band operation. In my VXO, both versions produced a frequency swing of about 30 kHz but the capacitor had a center frequency about 10 kHz higher.

To get started, the VXO can be built using the schematic in Figure 13 and Figure 14 is a photo of the completed unit. You will notice from the picture that my VXO used the optional variable capacitor and a homebrew dial. If you use a varactor, simply put the variable resistor controlling the frequency in its place. You can generate a simple frequency indicator and dial similar to what was used in my 40M transceiver article published in the Spring 2010 issue of *QRP Quarterly*. Building the VXO is straightforward. The 11 MHz oscillator and frequency doubler are located on the board directly adjacent to the variable capacitor. A short piece of coax is used to connect doubler output to the 23 MHz bandpass filter and amplifier located on the rear aluminum panel. Once you have completed construction, take the

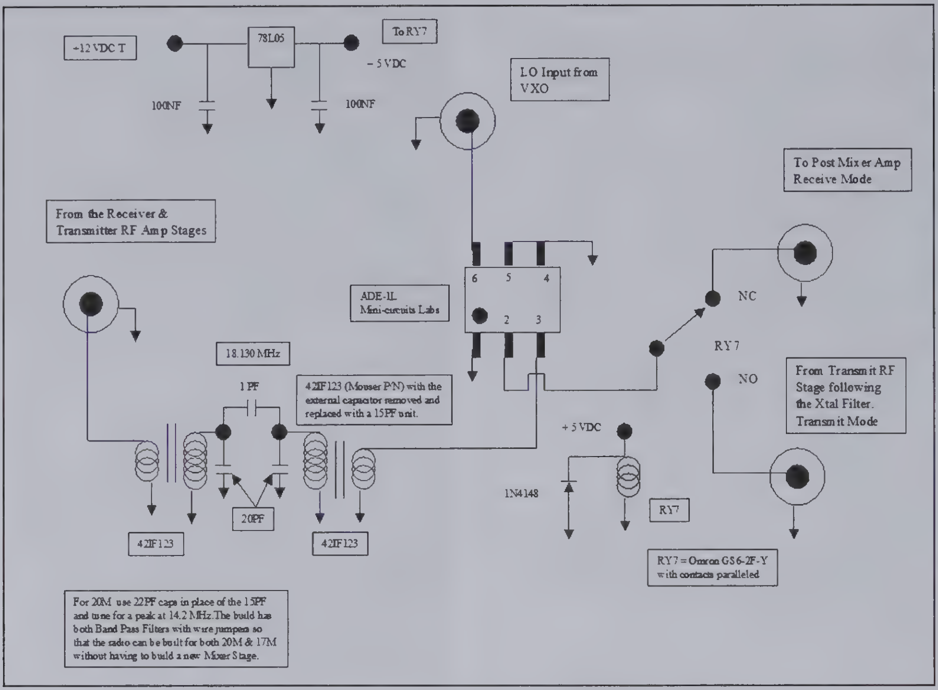

+12 VDC T
78L05
To RY7
- 5 VDC
100NF
100NF
LO Input from VXO
To Post Mixer Amp Receive Mode
From the Receiver & Transmitter RF Amp Stages
6
5
4
2
3
ADE-1L Mini-circuits Labs
NC
RY7
NO
18.130 MHz
1 PF
42IF123 (Mouser P/N) with the external capacitor removed and replaced with a 15PF unit.
From Transmit RF Stage following the Xtal Filter. Transmit Mode
+ 5 VDC
1N4148
RY7
20PF
42IF123
42IF123
RY7 = Omron GS6-2F-Y with contacts paralleled
For 20M use 22PF caps in place of the 15PF and tune for a peak at 14.2 MHz.The build has both Band Pass Filters with wire jumpers so that the radio can be built for both 20M & 17M without having to build a new Mixer Stage.

Figure 16—Receive/Transmit Mixer and Bandpass Filters schematic.

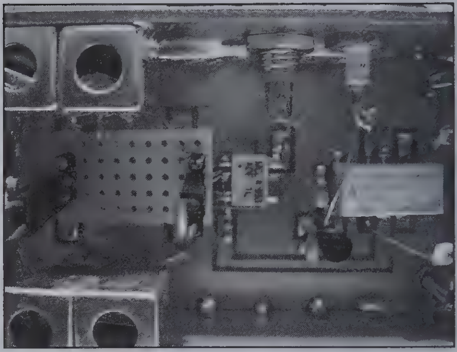


Figure 16—Receive/Transmit Mixer and Bandpass Filters module.

usual break and recheck your wiring.

The test of the VXO after assuring all wiring is correct and there are no shorts or solder bridges is to power up the unit and use the RF Probe to look for an output. If no output is present, use the standard approach of checking the source of power to the VXO and the VXO amplifier. See if there are any cold solder joints or incorrect wiring or the possibility of installing the right component in the wrong place. Using the RF Probe, another check is to rotate the frequency control through its range while simultaneously observing that there is output across the range. One final test is to insure the tuning range of the VXO is within the 17M SSB portion of the band, 18.110 MHz to 18.168 MHz. In my VXO, I am able to tune 18.118 to 18.153 MHz. To check your range tune a General Coverage receiver to 23 MHz and at the low end you should hear a signal at (18.118 MHz + 4.9152 MHz(IF)) 23.033 MHz to 23.068 MHz (18.153 MHz + 4.9152 MHz), or thereabouts if your range is slightly different. Most importantly, your range should not be below 23.025 MHz or above 23.083 MHz or you will be outside the 17M SSB subband.

With the VXO module complete, we will move to the RxTx mixer stage and Bandpass Filters module. Figure 15 is the schematic. The only unusual point about construction is the mounting of the surface mount ADE-1L mixer. Figure 16 shows you how I did it, making pads on a piece of PC board. You can make similar pads for the mixer leads using a straight edge and scratch awl. Of course, you will want to make these pads while the board is blank and before constructing the enclosure for this module. Figure 16 also shows a modification I made in my version of this module. Looking ahead to the time when you replace the VXO with a synthesizer, you may want to do something similar. What I found when tuning the Bandpass Filter was that a simple re-tuning of the slugs in the transformers covered both the 17M and 20M bands. But I figured in time the slugs would not be tight and there needed to be a better approach. In my final build, I installed Band Pass Filters for both 17 and 20M. Using two three-terminal PC Board signal pins and two jumpers, band switching requires simply moving the jumpers from Pin 1 and 2 on each set to Pins 2 and 3. It takes all of about 3 seconds. A more elegant approach would use an actual bandswitch or perhaps two relays -but why not something simple? Figure 16 shows the placement of band change pin connectors and the additional transformers.

A special note about the ADE-1L mixer —its cost in small quantities is around $15. However, in quantities of ten or more, the cost is less than $4 each. So, ten mixers cost less than three mixers! Since the ADE-1L is useful across the entire HF range, you may want to look ahead and buy at least ten or more.

We have now completed all modules of the receiver portion of the transceiver and are at a point where we can begin testing. This is where being anxious can get one into trouble and after all of this hard work we certainly don't want to do that! Take a coffee break and think about how to connect all of the modules so that something doesn't inadvertently short to ground and major parts of your hard work go up in smoke. If the modules have been built complete with the enclosures and the PCB "L" brackets then we have a way to do this and it involves the use of a 18" x 18" piece of 1/2-inch plywood. This is an old technique called "breadboarding." In olden days, hams would frequently take the family breadboard and build radios on it so a lot of recycling here. Figure 17 shows an example of this technique using the breadboard I built for a similar project, not JABOM. A 2 foot square board should be sufficient for your breadboard. The process is simply one of using small wood screws and tacking the modules to the breadboard and making all of the interconnections. At this point you will need to build eight RG-174/U Coaxial Jumpers with RCA plugs on each end. The lengths should be about 8 to 10 inches. Carefully look at the various schematics and identify what goes to what. Double-check everything!

Look carefully at Figure 17 and in the center you will see several terminal strips as this offers a convenient means of interconnecting power to the modules and I highly recommend that you connect power to the modules individually and then test

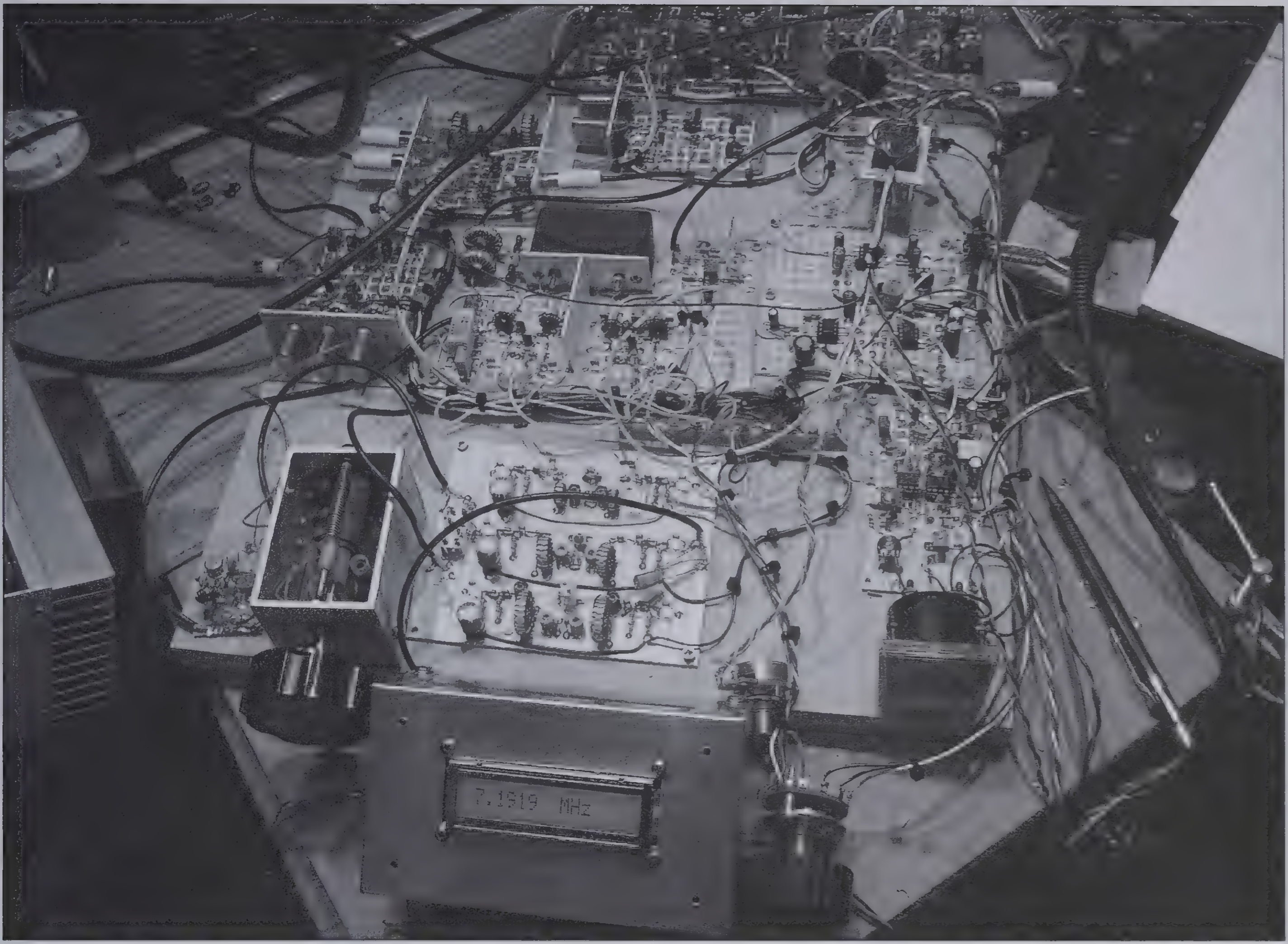


Figure 17—It takes a big photo to show a typical "breadboard" layout!

that module. This is the same process you used for the build and it should be repeated here. Connect power to the audio amplifier stage, then the BFO/CIO, and connect but don't power on the Hybrid Cascode IF Amplifier and Product Detector. Power up the Test Oscillator and bring the test lead near pin 1 on the Product Detector and check for an output in the speaker. Then power on the successive circuits and using the Test Oscillator as a signal source run all of the tests that were run previously. The only thing the process won't check is the Tx Rx Mixer; but it does tell you if there is a problem. With no signals being received, the problem has to be in this module.

So assuming all is in working order, we proceed to the test of hooking up an antenna and the LO to the Rx Tx mixer module. Connect your favorite antenna and start by tuning the Band Pass Filter slugs in the Rx Tx module, looking for an increase in background noise. It should be really perceptible. If not, there is a problem with this stage. Using the RF probe check to see if there is signal present at the LO port. Unplug the LO and there should be a change in background noise. If there is no noise, this also affirms a problem. Check the wiring to the ADE1-L and that the relay contacts have been wired so that on Receive the NC contacts are connected to the receive port. This is where the value of the breadboard is really evident as the only circuit with any problem is readily identified.

Now let us assume the best outcome and that is there is an increase in background noise, tune the VXO or Si570 through its range and listen for any signals. What a thrill to hear the receiver come alive! Pat yourself on the back as you are 2/3 of the way through the process of having a complete transceiver. You can even leave the receiver "on" while you build the transmitter circuits and the breadboard will also serve you well as you add in the transmitter circuitry. There is a method to my madness.

A Good Stopping Point

The receive portion of your transceiver is now complete. In the next issue, we will finish up the transceiver and talk about packaging in its final form. In the meantime, be sure and check my website, http://www.jessystems.com/. On it, there will be a link to this project containing parts lists with suggested suppliers and other information.

—73, Pete

●●

Portable Antenna Success

Joe Everhart—N2CX

This is a "classic" article, a repeat of N2CX's presentation at FDIM 1997. Note that some of the reference material Joe listed at that time may be outdated and no longer available. —Ed.

The QRP movement has spawned a renewed interest in many aspects of amateur radio. And one of the more popular pursuits is portable hamming. Many QRP rigs are small and light, with minimal power needs so they're easy to carry along when engaged in backpacking, camping, canoeing and a variety of other outdoor activities. In fact, common interests in just this sort of activity have given rise to an organization dedicated to furthering hamming in the great outdoors, the Adventure Radio Society. As with all of ham radio, the key to enjoying portable operation is the antenna used. This paper presents some skywire ideas to make portable QRP'ing successful.

Introduction

Portable operation can take many forms, but let's divide it into just two categories, "casual" and "serious" portable operation. "Casual" portable operation is the kind you can do at a moment's notice. It uses simple, lightweight gear that can be easily taken along in conjunction with other outdoor activities without prior planning (in a backpack perhaps) and can be set up and torn down in a couple of minutes. And, because of the spontaneity of this kind of operation, it means that you often set up antennas and operate nearly anywhere. Popular QRP "Afield", "To The Field" and "Spartan Sprints", with their short duration are extensions of casual operation as well.

"Serious" portable operation, on the other hand, requires malice aforethought. In other words, it is usually a planned undertaking whereyou use the same equipment and perhaps even the same antennas as at your home QTH. The location is usually chosen and scouted in advance so that proper antennas can be used and there is plenty of setup and teardown time. Traditional Field Day operation falls in this category.

The rest of this discussion will focus on casual portable operation and how to use some familiar antennas to make it successful. But first some definitions ...

Output Power	dB	Strong Signal	Average Signal
100W		S9	S7
5W	-13	S7	S5
1W	-20	S6-	S4-

Table 1—QRO vs. QRP signal strength.

Efficiency and Effectiveness

Success with a portable antenna means that the antenna has to be as easily transported as the simple QRP rig you use. Also it has to be easy and quick to set up and take down—nearly anywhere. And, most importantly it has to make best use of your few meager watts of RF efficiently and effectively.

The bottom line for effectiveness is—can you make contacts? An antenna that is easy to carry, quick to set up and cheap to buy is absolutely useless if you can't use it to make QSO's. Unfortunately too many portable QRP antennas (and lots of home antennas too) fall in this category.

It is obvious that your signals will be weaker using QRP, but how much weaker? Engineers use dB levels to describe power and signal strengths, but hams think in terms of "S-units." Rough conversion between dB signal levels and S-units can be made by using the rule of thumb that 6 dB equals one S-unit. And 6 dB corresponds to a 4x change in power level. That is, if a QRP transmitter operating at the QRP gallon level (5 watts) produces a received level of S6, quadrupling the power to 20 watts will increase the received level to S7.

QRP vs. QRO

Using the dB to S-unit conversion method, you can adjust your expectations for success as compared to a "typical" QRO station operating at 100 watt transmitter. Table 1 gives the results. (I have arbitrarily defined an average signal as S7 and a strong signal as S9.)

You can see that if the QRO rig produces a "strong" (S9) signal, the 5 watt QRP rig will have one that is only S7, and a 1 watt QRPp operator would tickle a receiver with signal less than S6. And, if the QRO operator had only an "average" signal, the poor QRPp station would have a VERY weak signal indeed.

		% Efficiency		
		50	25	10
Signal		(-3dB)	(-6dB)	(-10dB)
QRO	S9			
QRP	S7	S6+	S6	S5
QRPp	S6	S5	S5	S4

Table 2—Strong signals.

		% Efficiency		
		50	25	10
Signal		(-3dB)	(-6dB)	(-10dB)
QRO	S7			
QRP	S5	S4+	S4	S3
QRPp	S4-	S3	S3-	S2

Table 3—Average signals.

Effects of Poor Antennas

These comparisons assume equal antennas for the QRO and QRP stations. When you add in the effect of sub-par antennas for the QRP cases, things get even worse as you can see in Tables 2 and 3. Here you can see the added disadvantage of a poor antenna on the QRP setups. The columns labeled with percentage are for antennas with either loss due to inefficiency or less gain than in the QRO case.

The comparisons are NOT intended to give a pessimistic view of portable QRP operation, but to show the importance of using the best antenna that you can!

Guidelines for Effective Antennas

As is evident from the comparison tables, effective antennas for QRP portable operation absolutely cannot waste any precious transmitter power. The most important things to keep in mind are that the antenna you use must have an inherently high radiation efficiency and that they put out power where you want it.

Radiation efficiency means that you

don't want to waste any power by converting it to heat. As will be discussed later, some popular portable antennas trade size and convenience for poor efficiency.

Equally important is using antennas that don't waste power by radiating power where it won't do any good. To do this, antennas must be used that don't lose their power in the immediate surroundings or that radiate them at the wrong angle so that the ionosphere reflects them to the wrong location.

For the purpose of this discussion, two types on ionospheric propagation will be considered. Naturally this is a gross oversimplification, and it is left to the interested reader to pursue the matter further.

For communication out to several hundred miles, a relatively high angle of radiation is effective so that the signals bounce right back down close to their source in a single "hop". More distant propagation results from lower radiation angle reflecting off the ionosphere in multiple hops. Grossly speaking then, high angle radiators are useful for closein contacts out to several hundred miles ("local"), while low angle radiators provide more distant propagation ("DX").

Another consideration for easy portable operation is simplicity. The idea antenna should be simple in construction, easy to erect and take down and should need a minimum of adjustments in the field.

A secondary feature that is handy, but not necessarily essential for casual portable operation is the ability to use the same antenna on more than one band. However, multibanding often compromises efficiency, complexity and radiation pattern

Antenna Choices

There are a number of different antenna configurations to consider. Table 4 shows a number of antenna categories and their characteristics. A discussion of tradeoffs between these antennas types follows the table.

Antenna Type	Efficiency	Local/DX	Comments
Center Fed Dipole			
Horizontal	High	Either	Simple
Inverted Vee	High	Either	Single Support
Vertical	High	DX	Needs High Support
End-fed Wire			
Random Length	Variable	Either	Needs Tuner
Half-Wave	High	DX	Needs Tuner
Vertical (monopole)			
Ground Mounted	Variable	DX	Needs Good Ground
Elevated	High	DX	Needs High Support
Electrically Short			
SLV	Variable	DX	Needs Good Ground
Mobile Whip	Low	DX	Needs VERY Good Ground
Large Loop			
Square	High	Either	Needs Multiple Supports
Delta	High	Either	Needs Multiple Supports
Half-Square	High	DX	Intermediate Complexity
Small Loop	Low	Either	Bulky, Low Bandwidth
Phased Array	>100%	Either	Complex
Parasitic Array	>100%	Either	Complex

Table 4—Comparison of antenna characteristics.

Center Fed Dipoles

The good old dipole, Figure 1, is often the best choice for portable operation. If erected at least 20 feet or so above ground, it is very efficient and will give good local coverage. Heights above a quarter wavelength will give better DX results. In general the higher the dipole the better its overall performance. However, as shown in Figure 2, it is usually erected horizontally. and requires two high supports.

A somewhat more practical configuration is the inverted Vee, Figure 3, where the dipole requires only one high support for its center. This has the additional advantage of eliminating the need for the dipole legs to support the weight of the antenna and feedline, so that lightweight materials can be used. For example the PVC Gusher II antenna described in the April IS96 72 newsletter weighs less than a pound and can be carried in a zip-lock bag. Many other similar designs are found in QRP literature.

A dipole antenna can also be erected either as a sloper, Figure 4. or a vertically for improved DX results. Dealing with the feedline can be a problem since it should be brought away from the dipole at right

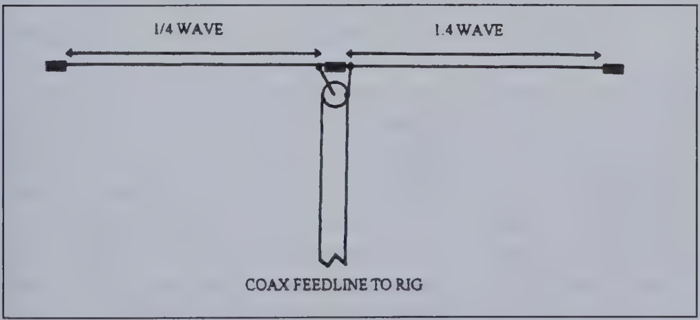


Figure 1—Half-wave center-fed dipole.

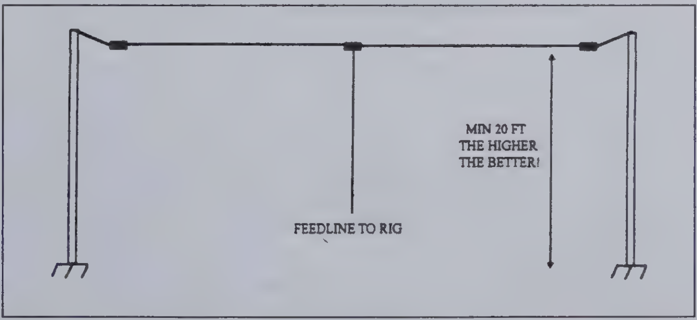


Figure 2—Horizontal center-fed dipole.

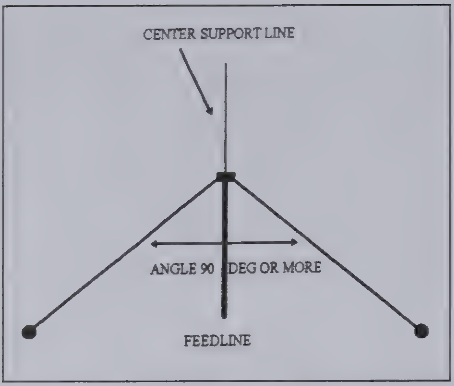


Figure 3—Inverted-Vee type center-fed dipole.

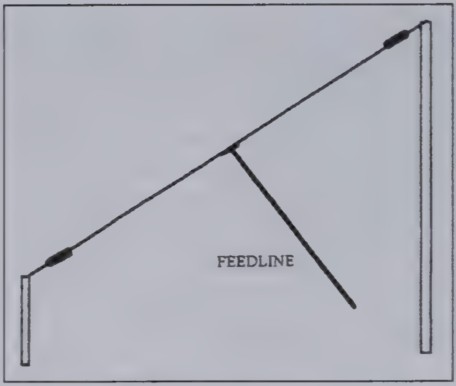


Figure 4—"sloper" dipole.

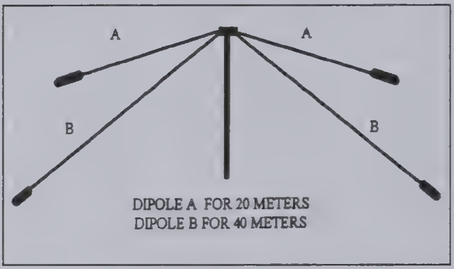


Figure 5—"Fan" dipole with parallelled elements.

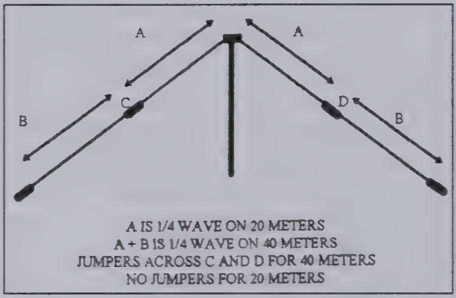

A
A
B
C
D
B
A IS 1/4 WAVE ON 20 METERS
A + B IS 1/4 WAVE ON 40 METERS
JUMPERS ACROSS C AND D FOR 40 METERS
NO JUMPERS FOR 20 METERS

Figure 6—"Leapfrog" two-band segmented dipole.

angles, and finding a suitable high support can be a difficult. The excellent book *HF Antennas For All Locations* by Moxon, GGXN, has some very good ideas for maximizing DX performance of dipoles and slopers.

Multiband operation of dipoles can be achieved in several ways.Adding multiple elements in parallel at a common feedpoint, Figure 5, can be effective but requires additional supports for the added legs, Figure 6. With an inverted Vee configuration the dipole can be broken into segments for multiple bands and jumpers used to select the appropriate segments. Both configurations are described in the Gusher II article.Another method of achieving multiband performance used in permanent installations is to use of open wire feedlines with a dipole. This may not be practical for portable operation since a high efficiency balanced tuner is required.

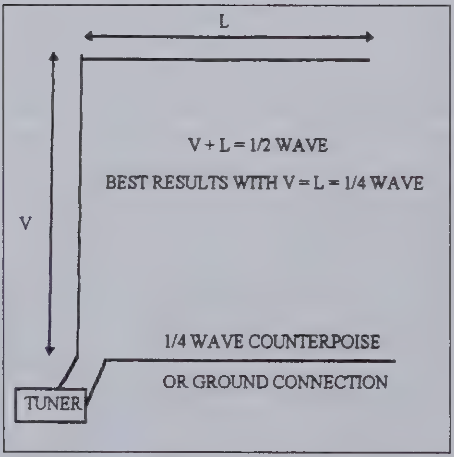


Figure 7—Half-wave end-fed wire as Inverted L.

End Fed Wires

End fed wires are very commonly used in portable operation. They can be simple to put up and easy to use. However random-length wires may not be a good choice. In general they need to be used with a tuner to match their arbitrary impedance to the usual 50 ohm impedance required by most rigs. If the wires are either shorter than a quarter wavelength or multiples of that length, they have a low feedpoint impedance and need a very good ground system to achieve acceptable efficiency. As with center fed dipoles, the higher they are put up, the better they perform.

Half-wave end-fed wires have some very pronounced advantages. Since they have a high feed-point impedance, only a simple ground connection or quarter wave counterpoise is needed for high efficiency. While they do need tuners, the tuners can be simpler than the general-purpose ones needed for random wires. A simple parallel tuned resonant circuit can be used effectively to tune half-wave wires. Recent articles in *QRPp* and *QRP Quarterly* describe the Rainbow Tuner, an ultra-lightweight combination tuner and SWR bridge optimized for portable operation with end-fed half-wave wires. And multiband operation is enhanced by the fact that the traditional HF amateur bands are harmonically related and the high impedance characteristics repeat at even multiples of a half wave. The half-wave can be used in several ways. The most common way is the inverted L, shown in Figure 7. This can be a good choice, particularly for the lower frequency HF bands if its vertical and horizontal sections are each a quarter wave long. This puts the center of the wire (where does most of the radiating) at the highest point and gives a combination of high and low angle radiation.

Another attractive half-wave structure is the end-fed inverted Vee shown in Figure 8. It has the same simplicity of the center fed dipole and eliminates the potentially heavy feedline at the center.

Slopers, Figure 9, and vertical halfwave antennas, Figure 10 are even more practical when end-fed than when center fed and suitable for the higher frequency HF bands with common supports like trees.

Verticals

The verticals considered here are ones that are a quarter wavelength or shorter. Longer ones were discussed above. A common benefit of most verticals that are a half-wavelength or shorter is that they radiate at low angles. So any power that is radiated will give good DX results.

Probably the simplest vertical antenna used by portable operators is mounted with its feed point at ground level, Figure 11. Though the most convenient type of vertical, this can be the worst kind if not done correctly. The first problem with ground mounting, is the need for a large number of radials to get high efficiency. The *ARRL Antenna Book* estimates that the efficiency of such an antenna may be less than 50 percent even with as many as 15 radials! Using fewer radials can waste even more transmitter power.

Another disadvantage of groundmount-

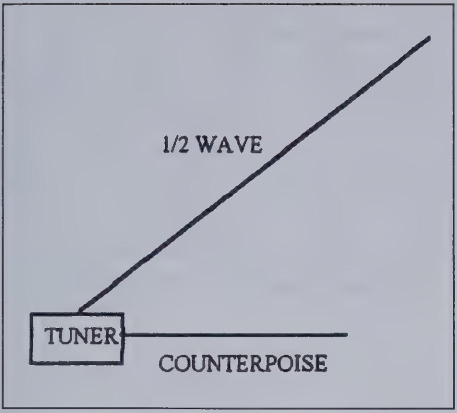


Figure 9—End-fed "Sloper."

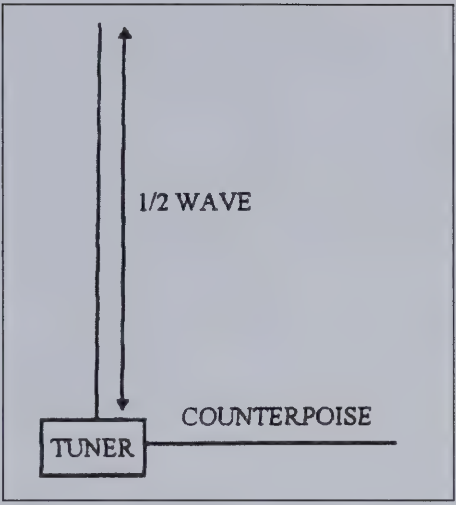


Figure 10—Half-wave end-fed vertical.

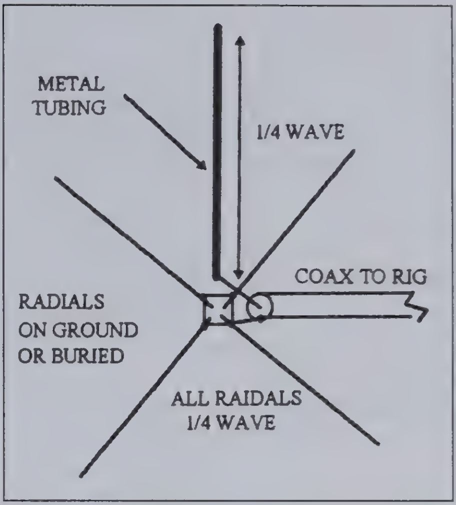


Figure 11—Ground-mounted vertical.

ing is that most of the signal is radiated from the antenna at ground level and at a low angle. This means that unless the area around the groundmounted vertical is clear of surrounding objects, any power radiated may be absorbed before it even gets anywhere! Efficiency is even worse as the vertical is shortened below a quarter wavelength since the radiation resistance decreases rapidly with shorter lengths and loss from ground systems has an even greater effect. The *ARRL Antenna Book* shows that radiation efficiencies of common mobile whip type antennas can be only 10 percent or even less.

An interesting portable vertical antenna, the Saint Louis Vertical devised by NOFR, has been described in a recent issue of QRPp. For support it uses a 20 foot telescoping fishing pole which makes it easy to carry and set up. Several matching methods have been described on the Internet QRP mail list, QRP-L, including the original matching method using (what else?) the Saint Louis Tuner and a very clever adjustable loading coil designed by W0MMA. Details of the matching methods can be found on the NorCal web page and will be written up in the NorCal journal QRPp. For ham bands where the antenna is on the order of a quarter wave or longer, it can be fairly efficient and relatively easy to set up and take down. For best efficiency, more than the recommended three radials should be used, but they don't have to be resonant. Twenty feet is an acceptable radial length.

Vertical antennas that are raised above ground level as shown in Figure 13 can be very useful. They retain the inherent low angle radiation pattern important for DX while eliminating the loss due to non-conductive earth by raising their ground system above it. Elevating the radiating region of the antenna also helps eliminate absorption by its immediate surroundings. For the lowerfrequency HF bands supports high enough to be useful may be hard to find, but for 20 meters and above, trees may be a viable option.

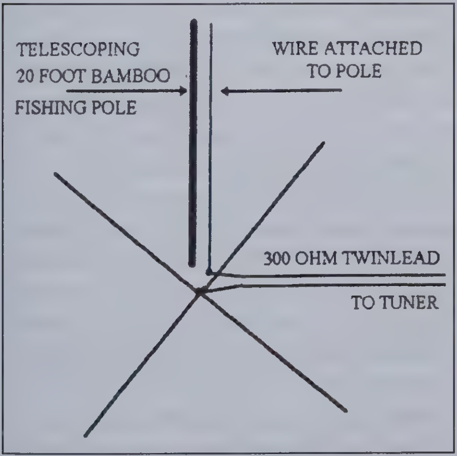


Figure 12—"St. Louis" vertical antenna.

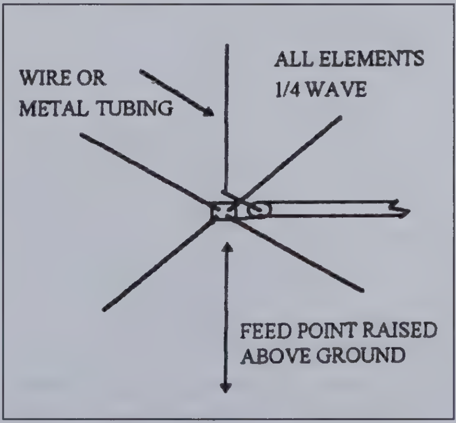


Figure 13—Elevated ground plane.

Large Loops

Large loops, like those in Figure 14, are defined as those whose periphery is one wavelength or more, are excellent antennas. They combine high efficiency with the potential for either close-in or DX communications. If mounted horizontally at heights below 1/4 wavelength they are good high-angle antennas. If elevated higher or if mounted vertically, large loops are superb DX antennas. Common shapes are either square or triangular. The need for a number of fairly high supports limits the loops' usefulness for casual portable operation.

A variation of the large loop, the so called half-square shown in Figure 15, must also be considered for portable use. It is half of a large loop erected vertically. Its length is approximately one wavelength. Since it appears electrically as an unsymmetrical dipole with 1/4 wave of wire on

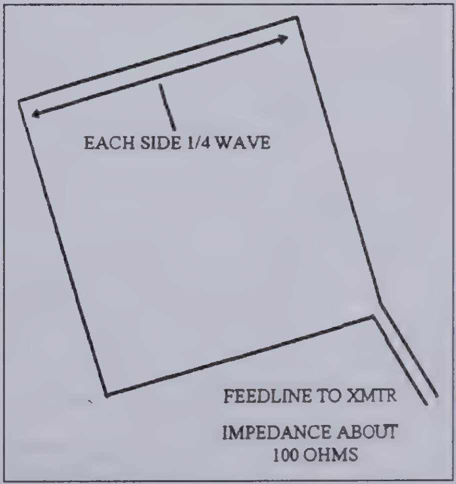


Figure 14—Full-wave loop.

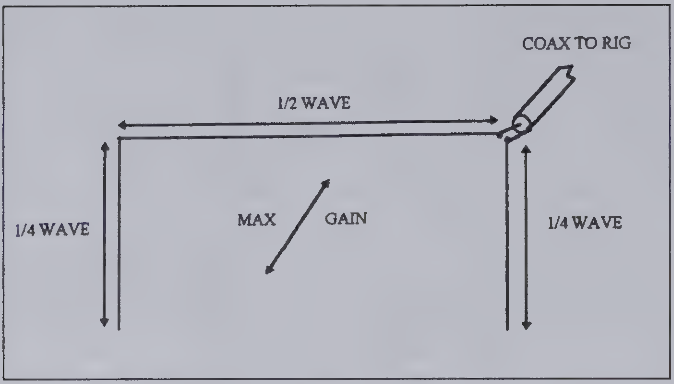


Figure 15—Half-Square antenna.

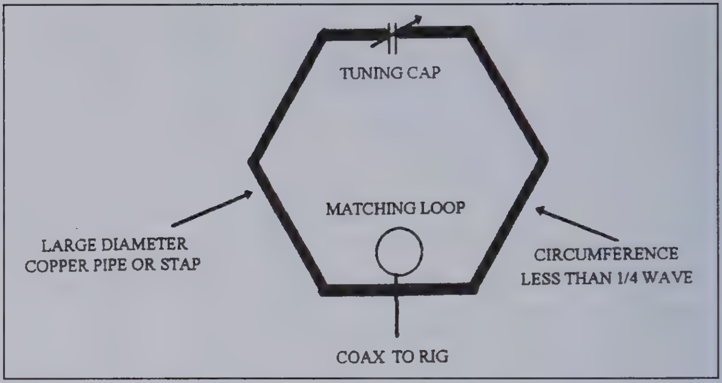


Figure 16—Small Loop antenna.

one side of the feedpoint and 3/4 wave on the other side, it has an impedance similar to halfwave center fed dipole. Radiation is at right angles to its longest side and is at a low angle.

Small Loops

Loops that are less than a quarter wavelength in circumference, Figure 16, may seem handy for portable operation because of their small size and fairly simple structure. Unfortunately they have a number of disadvantages that usually rule them out. Most relate to their extremely low radiation resistance. It is so low that even the loss in its conductors must be minimized by using wide straps or large diameter metal tubing and very carefully welded joints. Even tuning capacitors must be special low-loss types. And to add insult to injury, small loops have very high operation Q factors which mean that they must be retuned if operation is desired over more than a few kilohertz. Commercial small loops made by AEA and MFJ are useful, but are expensive and too heavy and bulky for casual portable use.

Phased and Parasitic Arrays

Multiple-element arrays of dipoles or verticals are often used in home QTH installations to produce directive patterns. They have the benefit of making a transmitter appear to be much stronger than it is by not radiating the signal in all directions. Unfortunately they are usually much too large and complicated to be considered for casual portable use.

What is the Best Antenna?

Asking this question is like discussing sex politics and religion—”everybody is right and everybody is wrong! The best antenna is really one that meets your expectations.

I’ll show you mine if you show me yours!

1. The center fed dipole is my first choice. As described earlier, it is efficient, has predictable performance, and, depending on available supports, can be set up for either local or DX contacts. Multi-band operation is easy with a segmented “leapfrog” dipole erected as an inverted vee.

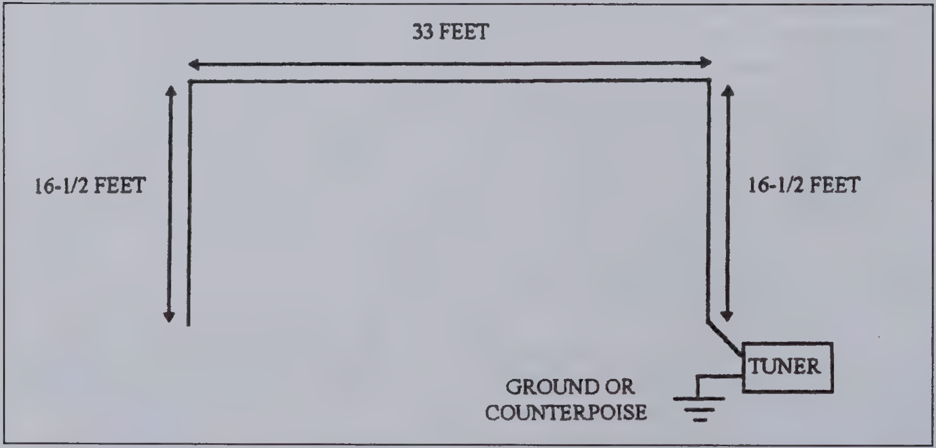


Figure 17—40-meter end-fed half-wave as a Half-Square on 20 meters and a quarter-wave “bent vertical” on 80 meters.

2. The end-fed half-wave antenna is nearly identical in performance to the center-fed dipole. While it does need a tuner, a simple, lightweight one is easy to build. A variation on this theme is a 20 meter end-fed half-square. Electrically, it looks like a full-wave antenna on 20 meters and can be pressed into service as an end-fed halfwave wire on 40 meters. And, on 80, it is an electrical quarter wave. For 20 it has a good low angle of radiation for DX while it is a fairly good high angle compromise antenna for 80 and 40.

3. Vertical antennas are hard to beat since they are fairly easy to set up and they push their power out toward the horizon giving very good DX performance. The major difficulty with them for portable use is finding a design that is not too bulky to carry along. For the higher frequency HF bands, an elevated vertical is attractive. Putting it up above ground clutter allows it energy to be radiated where it won’t be absorbed locally. And keeping it up in the air away from the lossy ground. A sketch of an elevated wire “ground plane” antenna has been shown in Figure 13. It would be just as effective on the lower HF bands if 100 foot trees were common.

The St. Louis Vertical has great promise, too, particularly for 30 meters and above. On 30 it is almost a quarter wave long and on 20 and 15 it is longer. With a half dozen or more radials, it should perform well. Since it is vertically polarized it radiates at a low angle, and, if put up in the clear, can do a pretty credible job. Though maybe a little heavy for backpacking, it is convenient to most casual setups.

But don't just go on my word, check out the references listed at the end of this paper for yourself. The *ARRL Antenna Book* and the Moxon book have plenty of general information on antennas and there are frequent articles on QRP antennas in the QRP newsletters. And portable antennas are a frequent topic on the QRP mail list. Check out a few ideas in your back yard so that you will have YOUR best antenna ready for your next QRP portable outing!

Appendix A

A Few Words About Masts

The best locations for portable operation don't always come with ready-made antenna supports. Strictly speaking you wouldn't usually carry along antenna masts for casual operation, but the topic of portable masts deserves mention. What you would like is a very lightweight mast that will fit into a backpack, and weigh no more than a couple of ounces, and be 100 feet tall. As with most things in life, you can't get what you want! But you can strike a good compromise. Here are a few ideas to consider.

Hardware mega-stores often carry telescoping painter's poles that can be pressed into service. They consist of three or four sections that nest inside each other for storage or carrying and can be purchased in lengths up to 20 feet or so. And 20 feet is probably the minimum length you want. I consider them marginal for several reasons. They weigh only a few pounds, but ones long enough to be useful are still almost 6 feet long telescoped down. And they are rather flimsy. As with most lightweight masts guying is needed.

There are other telescoping antenna masts that are stronger, but they too have disadvantages. 25 foot commercial "portable" masts can be purchased from ham dealers for on the order of $100.00. They telescope down to only about 6 feet and are heavy enough that you don't want to backpack with one. Amateur literature has had several versions of "walking stick" masts over the years that use several lengths of aluminum tubing carefully chosen to telescope and serve double duty as a walking stick while hiking. This may be a viable option if you have an inexpensive source of thin-wall aluminum tubing.

The telescoping fishing pole that serves as the support for the St. Louis Vertical is tempting. It is fairly light in weight and telescopes down to under 4 feet. Fully extended, it is 20 very "whippy" feet high, so it probably wouldn't be a very good center fed dipole support but might serve as a support for an inverted vee or inverted L end-fed wire.

An option for semi-serious portable operation is the NEQRP Twenty-30 Portable PVC Mast I worked up as a club project for NEQRP. It consists of four 5-foot sections of inexpensive PVC pipe that can be joined to make a 20 foot guyed portable mast. Total cost is under $30.00 with most of the material available in nearly every hardware store in the US. It was written up in the NEQRP newsletter, "72", and is available as a semi-kit (hardware and instructions supplied—you buy the pipe)

Appendix B

Antenna Lengths For Popular QRP Frequencies

The following formulas produce antenna lengths for common antennas at QRP frequencies. These formulas are presented for reference purposes. Except on 80 meters, an antenna cut for the middle of a band is usable over that whole band

One-quarter wave dimensions are for each leg of a half-wave dipole and the radiating element and radials of vertical and Marconi antennas. Half wave dimensions are for end-fed half wave wires. Full wave loops use the values in the one wave formula. You may note that the one wave values are NOT twice the half wave numbers since they are not subject to antenna "end effects." The formula given is the "traditional" one published in ARRL publications. There has been some question in the QRP community about the validity of this formula. Some have estimated that it gives lengths that may be as much as 20% too short!

Appendix C

Antenna Length Formulas

1/4 wave (Verticals or Marconis):

$$L(ft) = 234 / F(MHz)$$

1/2 wave dipoles:

$$L(ft) = 468 / F(MHz)$$

1 wavelength (for loops):

$$L(ft) = 1005 / F(MHz)$$

Note: To convert these lengths to the metric system, use the following factors. (Very continental, you know):

Feet to meters: $L(m) = L(ft) / 3.281$

Inches to cm: $L(cm) = L(in) \times 2.54$

and of course everyone knows that

$$L(cm) = L(m) \times 100$$

For example a quarter-wave wire for 7.04 MHz is 33'3" in length. Using the above conversions we can calculate the length expressed in metric units.

33 ft / 3.281 = 10.06m, or 10m 13.6cm

and adding the two gives a metric units length of 10m 13.6 cm

Appendix D

(see chart on next page)

Appendix E

How to Put up a Portable Antenna

Putting up wire antennas is always a fun proposition. Sometimes it is fun for the participants and often fun for onlookers. There are at least as many methods as there are folks putting up antennas. The following is a short discussion of methods mentioned on the QRP-L mail list. Trees will be assumed to be the temporary mast of choice

First of all you need an antenna! But then you knew that. And no matter what kind of support or antenna launching method employed you need some support line. Two popular types of line are nylon parachute harness cord and nylon seine twine. Both are strong, weatherproof and reusable. Harness cord is available from various military surplus sources and seine twine is very inexpensive at the ubiquitous hardware mega-stores. For temporary

Band	Segment	¼ wave	½ wave	full wave
75/80 meters	CW - 3.56MHz	65feet, 9 inches	131 feet, 6 inches	282 feet, 4 inches
	Novice - 3.71 MHz	63 feet, 1 inch	126 feet, 2 inches	270 feet, 11 inches
	Phone - 3.895 MHz	58 feet, 9 inches	117 feet, 5 inches	252 feet 2 inches
40 meters	CW - 7.04 MHz	33 feet, 3 inches	66 feet, 6 inches	142 feet, 9 inches
	Novice - 7.11 MHz	32 feet, 11 inches	65 feet 10 inches	141 feet, 4 inches
	Phone - 7.285 MHz	32 feet, 1 inch	64 feet 10 inches	127 feet 11 inches
30 meters	10.125 MHz	23 feet, 1 inch	46 feet, 3 inches	99 feet, 3 inches
20 meters	CW - 14.06 MHz	16 feet, 8 inches	33 feet 8 inches	71 feet, 6 inches
	Phone - 14.25 MHz	16 feet, 3 inches	32 feet, 6 inches	69 feet, 10 inches
17 meters	18.096 MHz	12 feet, 11 inches	25 feet, 10 inches	55 feet, 6 inches
15 meters	CW - 21.06 MHz	11 feet, 1 inch	22 feet, 3 inches	47 feet, 9 inches
	Novice - 21.11 MHz	11 feet, 1 inch	22 feet, 2 inches	47 feet, 7 inches
	Phone - 21.385 MHz	10 feet 11 inches	21 feet, 11 inches	47 feet
12 meters	24.096 MHz	9 feet, 9 inches	19 feet, 5 inches	41 feet, 8 inches
10 meters	CW - 28.06 MHz	8 feet, 4 inches	16 feet, 8 inches	35 feet, 10 inches
	Novice - 28.11 MHz	8 feet, 4 inches	16 feet, 8 inches	35 feet, 9 inches
	Novice - 28.335 MHz	8 feet, 3 inches	16 feet, 6 inches	35 feet, 6 inches
	Phone - 28.885 MHz	8 feet, 1 inch	16 feet, 2 inches	34 feet, 10 inches

Appendix D—Antenna length table.

installations, cotton line is usable, but it doesn't hold up like nylon or other synthetic lines. You may be tempted to use fishing line, but if you do, be very careful. It is nearly invisible to birds and other wildlife so it may pose a hazard to them while in use. And whatever you do with any line, don't leave it behind as it will not degrade over time and may remain a hazard for many years. Next are the methods, which fall in several categories .

First are the "armstrong" methods. They involve attaching a weight of some sort to the end of an antenna line and pitching it in some manner over the antenna support. Weights used by various folks have included fishing weights, assorted hand tools (many of which remain tangled in tree limbs - beware in the forest!), rocks, twigs, penknives, solid rubber balls, tennis balls and nearly anything else that a frustrated launcher might have within arm's length. Launching methods with the weights include the overhand toss, the underhand toss and the popular South American gaucho bolas toss. The latter is my favorite. To achieve this, you take the weight in one hand, then let out several feet of line so that the weight hangs down. Next, you spin line with the weight describing a circle. When you release the line, the weight will go off tangentially and, if you are extremely lucky, it may even go up in the direction of the antenna support.

And the first time it does, I usually find that the extra line I left on the ground to soar skyward has wrapped itself around my leg while the weight has reversed direction and is hurtling back toward me. Of course when I try to avoid the incoming missile, my encumbered legs prevent quick escape so I trip and fall *before* the weight homes in on my coconut! To minimize damage to property and bystanders, I use a fishing weight slid inside a slit tennis ball. The ball makes for a soft landing and its fluorescent color makes it easier to find when it gets away.

There are several other launching strategies that are in keeping with the outdoors theme of portable QRPing. They are the Robin Hood, the Isaac Walton and the David and Goliath maneuvers.

As you may have guessed, the Sherwood Forest trick involves using a bow and arrow. Impressive heights and pin-point accuracy can be demonstrated by a skilled archer. Most of us are lucky to get the line somewhere near the right tree. Two important precautions are imperative.

First, make sure that you work as a team with someone "downrange" who will warn passers by to evacuate the area and watch to see where the arrow lands. (Remember the second part of "I shot an arrow into the air...?) Second, make sure that the line is firmly attached to the arrow. That will limit its travel when it overshoots the mark.

Yes, the Isaac Walton method uses a fly-casting rod. It is amazing to see how well a talented caster can place a weighted line accurately in a tree. On the other hand, it isn't for the bashful. If you try it you will be questioned about your activities. Doug, KI6DS informed a curious neighbor that he was "treefishing!"

David of Goliath fame had nothing on modern-day sling-shot users. In most states, you can zip over to your local Walmart TM and pick up an inexpensive "Wrist Rocket." (In enlightened New Jersey you have to get a permit for them same as for a .38 Special!) The Wrist Rocket can be set up with a fishing reel to pay out line that is launched at the end of a one-ounce fishing weight.

One of the funniest tongue-in-cheek launching schemes was "recommended" on QRP-L. Someone was describing the nitrogen pressure cylinders sometimes seen at the base of telephone poles. In a fit of whimsey, another guy suggested the possibility of inverting the cylinder, tying on an antenna line, then breaking its neck with a hammer to rocket the line over a tree.

After several minutes of contemplation, he posted another message saying "Don't do it! I was just kidding!" He probably had visions of someone actually trying it with disastrous results and hitting him up with a monstrous lawsuit!

Appendix F

Safety and Responsibility

When you are putting up antennas and operating portable, please keep safety and responsibility in mind. Don't put up antennas so that they are a hazard to yourself, others around who might no see a low-hanging wire, or wildlife who are allowing you to share their home. Other hikers or campers DO NOT expect wires to be strung around a natural setting so don't put them where they MAY be a problem. And particularly in campgrounds, watch where you put up antennas. Many I've visited definitely did not meet local electrical codes so I never knew where they might have strung up their AC distribution wiring.

Always keep in mind what a Boy Scout leader impressed on a bunch of us "city kids" long ago. Don't destroy any trees or shrubbery and don't leave any manmade stuff behind. He told us that considerate campers leave a campsite in better shape than when they first came.

Appendix G

Resources

1. The Internet QRP e-mail reflector, "QRP-L" The e-mail reflector is an excellent source of information and assistance from the QRP community. Antennas and many other QRP-related topics are *always* under discussion. If you need information or help, just ask. There is sure to be an expert on nearly any topic who can give guidance. To subscribe to the list send an e-mail to <listserv@lehigh.edu>, with subscribe qrp-l your-name your-call in the body. You will get a reply message telling you how to use the reflector.

2. A variety of Internet web pages have QRP-related information. A few of the many are listed below. They, in turn have links to many others!

QRP ARC1
<http://RTPnet.org:80/-qrp/>

Internet QRP Club
chttp:/qrp.cc.nd.edu/QRP-Uindex>

NorCal (Northern California QRP Club
<http:l/www.fix.neV-jparker/
norcal.html>

NJQRP
chttp:llwww.njqrp.org>

Adventure Radio Society (ARS)
chttp:l/www.natworld.comlars~

3. A couple of invaluable reference books for antennas in general are:

ARRL Antenna Book — Published by the ARRL, this is the most comprehensive book for amateur radio antennas. I have even used it as a text for an antenna course for electronic engineers and technicians. No ham should be without it.

HF Antennas for all Locations — An RSGB publication by L.A. Moxon, G6XN. An excellent book with unique ideas on making antennas as effective as possible. Moxon bursts many bubbles about common ham radio antennas with good theoretical backing. He even discusses how to maximize antenna performance for QRP operation. No serious QRPer should be without it!

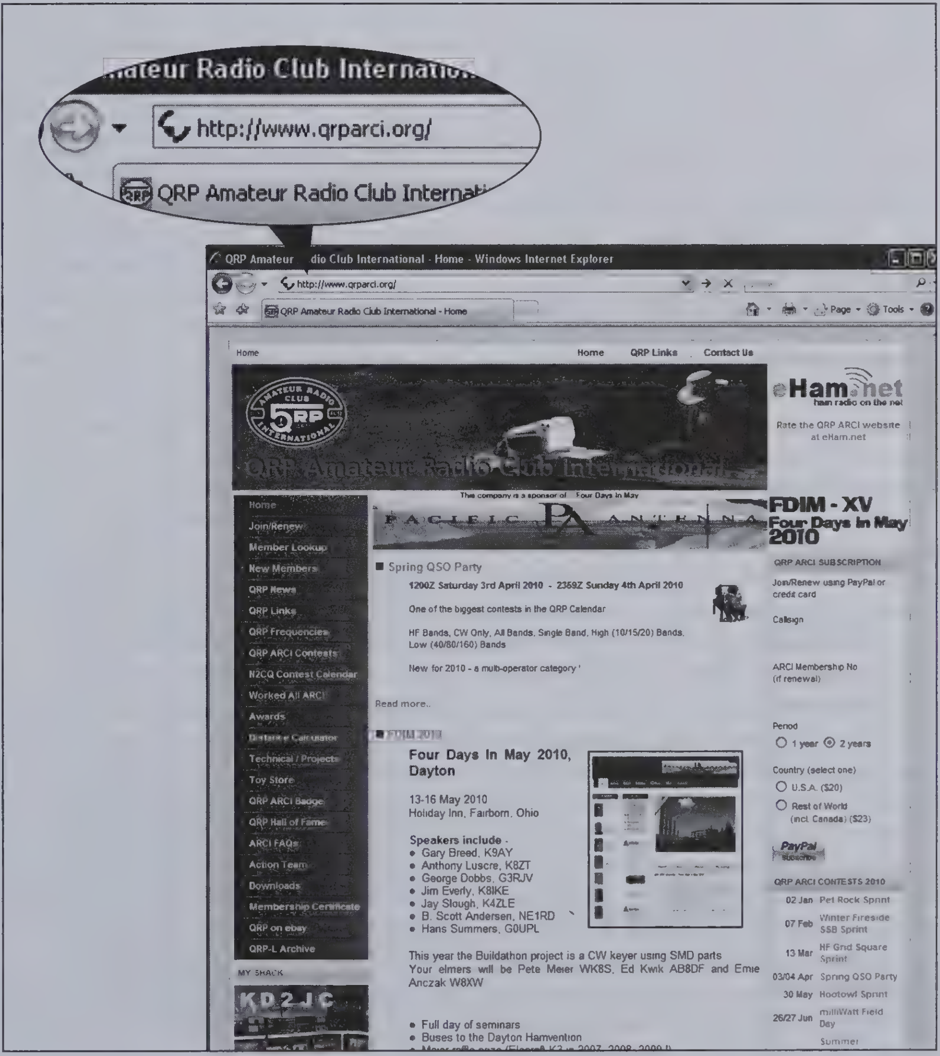
4. General amateur radio publications usually cover only general-interest ham antennas. There is a growing number of QRP newsletters which, naturally, focus more on QRP and portable applications. Some favorites are:

QRP Quarterly — The *Quarterly* is the newsletter for QRP ARCI. Having descended from the *Milliwatt,* an early US QRP publication, it is the grandfather of QRP newsletters in this country. It has articles by many familiar names from the QRP world and an Idea Exchange column that has short "tidbits" with excellent antenna and homebrewing ideas.

QRPp — Published quarterly by NorCal, *QRPp* has many cutting-edge QRP designs. It has featured a number of excellent antenna articles and a seemingly endless stream of QRP rig designs. Many projects that appear in *QRPp* excite worldwide interest.

72 — Circulated by the New England QRP Club, *72* has also printed a variety of popular QRP antenna and homebrewing articles (including several by the author of this paper). Although it has a smaller distribution than the first two newsletters, it carries frequent articles by some of the more prominent east coast QRP personalities.

●●



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HF Bands, CW Only, All Bands, Single Band, High (10/15/20) Bands, Low (40/80/160) Bands

New for 2010 - a multi-operator category '

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Four Days In May 2010, Dayton

13-16 May 2010
Holiday Inn, Fairborn, Ohio

Speakers include -
- Gary Breed, K9AY
- Anthony Luscre, K8ZT
- George Dobbs, G3RJV
- Jim Everly, K8IKE
- Jay Slough, K4ZLE
- B. Scott Andersen, NE1RD
- Hans Summers, G0UPL

This year the Buildathon project is a CW keyer using SMD parts
Your elmers will be Pete Meier WK8S, Ed Kwik AB8DF and Ernie Anczak W8XW

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- Buses to the Dayton Hamvention

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13 Mar	HF Grid Square Sprint
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30 May	Hootowl Sprint
26/27 Jun	milliWatt Field Day
	Summer

QRP Contests

Jeff Hetherington—VA3JFF

contest@qrparci.org

It's hard for me to believe, but I have been your Contest Manager for seven years now. Back in 2005, then QRP-ARCI President Dick Pascoe, GØBPS mentioned that we were in need of a new Contest Manager and I agreed to pick up the role. Little did I know just how pleasurable it was going to be to organize and run the contest offerings for QRP-ARCI. Over the years I have met and interacted face-to-face, by postal mail, and email with hundred of QRPers from around the world. I know I am not the first to say it, but let me repeat that QRPers are the nicest, friendliest and most knowledgeable operators on the bands today. Without the positive interaction with all of you, I would never have lasted this long in the position.

With that said, opportunities have been presented to me in my professional life that will make continuing on as your Contest Manager very difficult. Not wanting to see the operators and contest participants have to suffer, I will be stepping down from this role. I would like to take this opportunity to thank each and every member that reads this column, participates in one of our contests or says "Hi" when they see me in person. Please remember that participation is the key to the success of any contest offering, and I hope to hear you all on the air.

I am pleased to announce that starting with the 2001 Fall QSO Party, the new Contest Manager will be Jim Rodenkirch - K9JWV. Jim has been a long time ham, a contest operator, member of QRP-ARCI and avid QRPer. I am sure that he will achieve nothing but success in the QRP-ARCI Contest Manager Role, and I wish him all the best!

As for the contest offerings this quarter, we had another exciting round of contests, including the first ever running of the Welcome to QRP event. First up was the Hootowl Sprint contest that runs in the local evening times across the world. This is designed to test your operating skills as the bands change from day into night, and leading the way at demonstrating his skill at that challenge this year was Tim Colbert, K3HX. Tim was the only participant to surpass the 50k point plateau with a grand total of 50,589 points. This kept him ahead of second place finisher John Buchert, AE8M with 41,944 points, and Paul Kirley, W8TM and his third place total of 32,494 points. The top five were rounded out by Paul Stroud, AA4XX who pounded out 29,440 points with only 50 mW and Martin Gillen who went portable into Quebec for 19,630 points.

We have run a milli-Watt Field Day event in parallel with the ARRL's Field Day for the past several years. For 2012, this contest will be dropped from the QRP-ARCI offering as the ARRL does an outstanding job of running their Field Day, and recognizing the top participants as it stands. For 2011, the top scoring entrant in the mW Field Day was Dana A. "Mike" Michael, W3TS operating 1B-Battery for 8,932 points. Bob Patten, K4RUM was second with 7,672 points in the 1A Category, Lee Hiers, AA4GA took third with 6,286 points in the 1B Category, John Thompson, K3MD took fourth with 5,481 points in the 1E Category and in fifth spot was the Western New York QRP Society with 4,494 points in the 1B Category.

The Summer Homebrew Sprint contest for 2011 was hampered by questionable propagation and operating conditions everywhere. Conditions seemed good during the IARU contest that preceded the sprint, but died out quickly. Mike Bavoso, W6YDE persevered to take the win with an impressive 15,560 points. Just behind him was Tim Colbert, K3HX with 13,927 points, and in one of the closest three way battles that I ever saw, Jim Stafford, W4QO finished third with 11,568 points, Airel Jacala, NY4G fourth with 11,134 points and Barry Ives, AI2T finished fifth with 11,120 points!

Your new QRP ARCI Contest Manager, Jim Rodenkirch, K9JWV.

The 2012 Contest Calendar is printed elsewhere in this edition of *QQ*, and there are a couple changes. Along with the deletion of the milli-Watt Field Day is also the deletion of the End of Summer VHF Contest. Again this contest is well served by the ARRL through their September VHF Contest and our parallel contest only served as a tag-along. Replacing these two contests for 2012 are two exciting offerings that have been suggested by our members. In June 2012 we will be running the first QRP-ARCI Shootout. This contest

2012 QRP-ARCI Contest Schedule

7 January 2012	**Pet Rock Sprint**
29 January 2012	**Winter Fireside SSB Sprint**
10 March 2012	**HF Grid Square Sprint**
7 – 8 April 2012	**Spring QSO Party**
27 May 2012	**Hootowl Sprint**
16 – 17 June 2012	**QRP Shootout**
8 July 2012	**Summer Homebrew Sprint**
25 August 2012	**Welcome to QRP**
8 – 9 September 2012	**The Two Side Bands Sprint**
13 – 14 October 2012	**Fall QSO Party**
29 November 2012	**Top Band Sprint**
16 December 2012	**Holiday Spirits Homebrew Sprint**

2011 Hootowl Sprint Results

Name	Call	S-P-C	Bands	Pwr	#Qs	Pts	SPC	Mult	Bonus	Score	Rig & Antenna
Tim Colbert	K3HX	PA	ALL	< 5W	51	219	33	7	0	50589	Orion I, 80m vert., 40m & 20m dipoles
John Buchert	AE8M	OH	ALL	< 5W	50	214	28	7	0	41944	K3, Fan Dipole
Paul Kirley	W8TM	OH	40	< 5W	53	211	22	7	0	32494	K3, Inv Vee
Paul Stroud	AA4XX	NC	ALL	< 55mW	19	92	16	20	0	29440	TH6, 3 el 40m wirebeam
Martin Gillen	VA3SIE/VE2	QC	ALL	< 5W	25	110	19	7	5000	19630	KX1, Inv L
Barry Ives	AI2T	NY	ALL	< 5W		132	21	7	0	19404	K1, CF Zepp, 3 ele triband
Jack Stegall	WD4E	NC	40	< 5W		124	17	7	0	14756	K2, 80m Horiz Loop
Kelly McClelland	K4UPG	FL	20/40	< 5W	13	59	12	7	5000	9956	Sierra, 88ft Doublet
John Welch	AI4SV	MD	40	< 1W	9	33	6	10	5000	6980	Rockmite, Longwire
Brian Cieslak	K9WIS	WI	40	< 5W		76	12	7	0	6384	TS870S
Curt Milton	WB8YYY	MD	ALL	< 5W	18	84	10	7	0	5880	K2, MA8040 Vertical
Dave New	N8SBE	MI	40	< 5W	6	30	4	7	5000	5840	FT817, G5RV
Dennis Ledford	KE4I	GA	40	< 5W	14	67	8	7	0	3752	FT817ND, G5RV
Robert MacKenzie	VA3RKM	ON	ALL	< 5W	10	47	10	7	0	3290	K2, Verticals, Dipole
Garry S. Nichols	WA1GWH	NY	40	< 5W	11	49	9	7	0	3087	TS430S, 1/4 wave inv L
Phil Shepard	NS7P	OR	20/40	< 5W	10	41	10	7	0	2870	K3, 2 ele quad, 130ft CFZ
Donald C. Younger	W2JEK	NJ	20/40	< 5W	7	32	6	7	0	1344	FT840
Edwin "Ted" Albert	AB8FJ	OH	40/80	< 5W	4	20	3	7	0	420	
Phil Roland	N1DN	CT	20/40	< 5W	3	12	3	7	0	252	FT857D, Cobra Ultralite
Mike Zane	N6ZW	CA	20	< 5W	1	5	1	7	0	35	Index Labs QRP+

will demonstrate the proficiency of QRP operators in both voice and CW modes. The CW portion of the contest will run on Saturday, and be followed by the SSB portion on Sunday. Final score will be the combined efforts of both the CW and SSB segments, and there will be no single mode entry category. The other new contest will be the September running of The Two Side Bands Sprint. This contest will feature USB and LSB segments on Saturday, and again on Sunday. Those of you that are more proficient with the mic and the key will have your chance to really show that QRP SSB works! The remaining contest offerings from 2011 will carry over into the 2012 Contest Calendar.

Until next time, keep your power down and your QSO rates up!

—73/72, Jeff, VA3JFF

Top 5 Hootowl Sprint

Tim Colbert, K3HX	50,589 pts
John Buchert, AE8M	41,944 pts
Paul Kirley, W8TM	32,494 pts
Paul Stroud, AA4XX	29,440 pts
Martin Gillen, VA3SIE/VE2	19,630 pts

Hootowl Sprint Soapbox

Lots of big signals but not too many stations. Nice to work VA3SIE/VE2 operating portable from QC on both 40 and 20. 80M was too noisy for my 50 mW, with WB8YYY being the sole 80M log entry. Thanks to all the good ears out there. — **AA4XX**

Low QRN on 20 but big-time static crashes on 40 and 80m. Good to meet old friends again. **—K3HX**

Super Fun! Bands were noisy with QRN from nearby storms, Good turnout, was suprised to find 20m open from QC to FL at 0300Z. Enjoyed working AA4XX QRPp 50 mW and working fellow QRP enthusiasts. **— VA3SIE/VE2**

Strong signals on 20m the first hour, rough going on 80m due to QRN, then no readable signals at this QTH after 11pm local time. **—AI2T**

My first contest (except for FD) in 30 years as a ham. Great Fun! **—WD4E**

Enjoyed the challenge of being out in nowhere land in the dark. Fun event despite tough band condx. **—K4UPG**

I'm not a member, but I did take part in the May 2011 Hoot Owl Sprint last night. Thanks for running it. I think you've made a convert. I am entering as single operator, single band (heck, single frequency), portable station. I was camping with my family in Rocky Gap State Park in Maryland. My station consisted of a 40m rockmite with the 7.030 MHz crystal (likely outputting on around 7.029 or so). **—AI4SV**

It's always fun to meet fellow QRP'ers on a holiday weekend. I was able to get an hour of operating in between company and storms. **—K9WIS**

Category Winners
milli-Watt Field Day

1A: Bob Patten, K4RUM	7,672 Pts
1B: Lee Hiers, AA4GA	6,286 Pts
1B-Battery:	
Dana "Mike" Michael, W3TS	8,932 Pts
1D: Larry Mergen, KØLWV	2,030 Pts
1E: John Thompson, K3MD	5,481 Pts
2A: Edward R. Breneiser, W3PBC	2,324 Pts

milli-Watt Field Day Soapbox

My first FD on my own—usually operate with a group. **—AA4GA**

Though it was cloudy and rainy, our solar equipment managed to stay above the curve on our power budget! **—K2WNY**

Condx turned excellent for me after an initial lag. Ran at 25 Q's/hr on 40, including the territorial perimeter—KH6, KL7, MN, ME, FL, KP4, TX CA. 20 just kept coming until way after dark when I decided I had to get down to 40. Interesting propagation tidbit—I called two KH6's periodically on 15 and 20, and on each band I made the contacts with the pair within 5 minutes of each other. Talk about a path optimizing! No time for a log.... this'll have to do. **—WØRSP**

I was surpised to hear so much activity on 15m! **—K3HX**

I found the 7 MHz band seemed above normal for daytime propagation **—W5WO**

2011 Milliwatt Field Day Results

Name	Call	State	Bands	Pwr	Cat	Qs	Pts	Mult	Score	Rig & Antenna
Bob Patten	K4RUM	FL	ALL	< 5W	1A	561	1096	7	7672	K3, Mobile Hustler
Lee Hiers	AA4GA	GA	ALL	< 5W	1B	449	898	7	6286	FT817ND, Doublet
WNY QRP Society	K2WNY	NY	ALL	< 5W	1B	326	642	7	4494	K2, IC706, Norcal Cascade, 80m EFHW, 20m 3 Element Yagi, 6m 3 Element Yagi
John Watkins	N0EVH	MO	ALL	< 5W	1B		620	7	4340	K3, 135 ft doublet
North GA QRP Club	NO4GA	GA	ALL	< 5W	1B	199	398	7	2786	K2, K2, K3
Ade Weiss	W0RSP	AZ	ALL	< 5W	1B		370	7	2590	Sierra
Dana "Mike" Michael	W3TS	PA	ALL	< 5W	1B-Bat	638	1276	7	8932	K2, 130 ft doublet
Ron Hylton	AD7L	OR	ALL	< 5W	1B-Bat	78	156	7	1092	FT817ND, Buddipole, MP1
Larry Mergen	K0LWV	MO	20/40	< 5W	1D	145	290	7	2030	IC718, 20m dipole, 40m vee
Joseph Molon	KA1PPV	CT	20/40	< 5W	1D	8	16	7	112	SWL PSK Kit, Diamond BB7V
John Thompson	K3MD	PA	ALL	< 5W	1E		783	7	5481	Argonaut V, Loop/Skyhawk
Bill Cunningham	K4KSR	VA	ALL	< 5W	1E	238	476	7	3332	
Tim Colbert	K3HX	PA	ALL	< 5W	1E	196	392	7	2744	
Paul Neuman	KD2MX	NJ	ALL	< 5W	1E		278	7	1946	K1, 350ft longwire
Timothy Gordish	AD7AN	MT	ALL	< 5W	1E	79	159	7	1113	Argonaut V, SteppIR Vertical
Wayne Nickel	W5WO	TX	40	< 1W	1E	5	10	10	100	Homebrew, Wire Dipole
Edward R. Breneiser	W3PBC	PA	ALL	< 5W	2A	180	332	7	2324	

Top 5 Summer Homebrew Sprint

Mike Bavoso, W6YDE	15,560 Pts
Tim Colbert, K3HX	13,927 Pts
Jim Stafford, W4QO	11,568 Pts
Ariel Jacala, NY4G	11,134 Pts
Barry Ives, AI2T	11,120 Pts

Summer Homebrew Sprint Soapbox

Same as last year, not a lot of stations on after the big CW contest earlier, but I learned a lot about having a lot of fun. —**W6YDE**

Only got on for last hour but had fun. **—W4QO**

Top 5 Welcome to QRP

Newcomer:

Arthur Petteway, WB4MNK	5,140 Pts

Experienced:

Arnold Olean - K0ZK	23,060 Pts
Kelly E. McClelland, K4UPG	5,315 Pts
John T. Laney III, K4BAI	5,159 Pts
Scott McMullen, W5ESE	4,284 Pts

Welcome to QRP Soapbox

Had fun, though my ARCI number was the "newest" one I heard. Not sure the event had the desired effect. **—W5ESE**

Not the best condx. Glad to work some new callsigns, hope to hear you again! —**VA3RKM** ●●

2011 Summer Homebrew Sprint Results

Name	Call	State	Bands	Pwr	#Qs	Pts	SPC	Mult	Bonus	Score	Rig & Antenna
Mike Bavoso	W6YDE	CA	20/40	< 5W	5	16	5	7	15000	15560	KX1, Yagi in a bag, long wire
Tim Colbert	K3HX	PA	20/40	< 5W		51	11	7	10000	13927	K1, Dipole
Jim Stafford	W4QO	GA	20/40	< 5W		32	7	7	10000	11568	KX1, 3 ele yagi, horiz loop
Ariel Jacala	NY4G	SC	20/40	< 5W	6	27	6	7	10000	11134	K2
Barry Ives	AI2T	NY	20/40	< 5W	7	32	5	7	10000	11120	K1, 3 element triband yagi, CF Zepp
Rem O'Donnelly	K6BBQ	CA	20	< 5W	2	10	2	7	5000	5140	FT817, 40m EFHW
Dennis Burton	K6JSS/5	AR	15/20	< 5W	6	18	6	7	0	756	
John T. Laney III	K4BAI	GA	20	< 5W	1	5	1	7	0	35	FT1000MP, TH6DXX

2011 Welcome to QRP Contesst

Name	Call	S-P-C	Category	Bands	Pwr	#Qs	Pts	SPC	Mult	Bonus	Score	Rig & Antenna
Arthur Petteway	WB4MNK	FL	Newcomer	20	< 5W	2	10	2	7	5000	5140	KX1, Dipole
Arnold Olean	K0ZK	ME	Experienced	15/20	< 5W		129	20	7	5000	23060	
Kelly E. McClelland	K4UPG	FL	Experienced	20/40	< 5W	3	15	3	7	5000	5315	Sierra, EFHW
John T. Laney III	K4BAI	GA	Experienced	20/40	< 5W	14	67	11	7	0	5159	FT1000MP, TH6DXX, dipole, zepp
Scott McMullen	W5ESE	TX	Experienced	ALL	< 5W	12	51	12	7	0	4284	Omni VI, 300 ft Horiz Loop
Robert MacKenzie	VA3RKM	ON	Experienced	15/20	< 5W	11	55	9	7	0	3465	K2, Vertical
Barry Ives	AI2T	NY	Experienced	20/40	< 5W	10	44	8	7	0	2464	K1,CF Zepp, 3 element Yagi

Contest Announcements

Log Submission Information for QRP ARCI Contests

Email Log Submission:

Submit logs in plain text format along with a summary stating your Callsign, Entry Category, Actual Power and Station Description along with score calculation to: contest@qrparci.org

Snail mail Log Submission:

Submit logs along with a summary stating your Callsign, Entry Category, Actual Power and Station Description along with score calculation to:

[Contest Name]
c/o Jeff Hetherington, VA3JFF
139 Elizabeth St. W.
Welland, Ontario
Canada L3C 4M3

(Check www.qrparci.org to see when submissions should be sent to the new Contest Manager, K9JWV.)

2012 QRP-ARCI Pet Rock Celebration

Date/Time:

1500Z to 1800Z on 7 January 2012.

Mode:

HF CW only.

Exchange:

Members send: RST, State/Province/Country, ARCI member number

Non-Members send: RST, State/Province/Country, Power Out

QSO Points:

Member = 5 points
Non-Member, Different Continent = 4 points
Non-Member, Same Continent = 2 points

Multiplier:

SPC (State/Province/Country) total for all bands. The same station may be worked on multiple bands for QSO points and SPC credit.

Power Multiplier:

>5 watts = x1
>1 - 5 watts = x7
>500 mW - 1 watt = x10
>200 mW - 500 mW = x15
>55 mW - 200 mW = x20
<55 mW = x25

Suggested Frequencies:

Please remember this is a contest is focusing on rock-bound transmitters/transceivers.

80m	3560 kHz
	3568 kHz
	3579 kHz
40m	7030 kHz
	7040 kHz
20m	14060 kHz
15m	21060 kHz
10m	28060 kHz

Bonus Points:

For crystal controlled gear add 2,000 points for using rockbound receiver; add 3,000 points for using rockbound transmitter; or add 5,000 points for using rockbound transceiver. These bonus points are available per band.

If you are operating PORTABLE using battery power AND a temporary antenna, add 5000 points to your final score. (You can NOT be at your shack operating from battery power using your home station antenna to qualify for this bonus.) This is to help level the playing field for contesters who work from the field against contest stations with 5 element yagis at 70 ft.

Score:

Final Score = Points (total for all bands) x SPCs (total for all bands) x Power Multiplier + Bonus Points

Categories:

Entry may be All-Band, Single Band, High Bands (10m-15m-20m) or Low Bands (40m-80m)

How to Participate:

Get on any of the HF bands except the WARC bands and hang out near the QRP frequencies. Work as many stations calling CQ QRP or CQ TEST as possible, or call CQ QRP or CQ TEST yourself! You can work a station for credit once on each band.

Deadline:

Entries must be postmarked on or before 21 January 2012

Results:

Will be published in *QRP Quarterly* and shown on the QRP-ARCI website.

Certificates:

Will be awarded to the top scoring entrant in each category. Certificates may be awarded for 2nd and 3rd place if entries are sufficient in a category.

2012 QRP-ARCI Fireside SSB Sprint

Date/Time:

2000Z to 2359Z on 29 January 2012

Mode:

HF SSB only.

Exchange:

Members send: RS, State/Province/Country, ARCI member number

Non-Members send: RS, State/Province/Country, Power Out

QSO Points:

Member = 5 points
Non-Member, Different Continent = 4 points
Non-Member, Same Continent = 2 points

Multiplier:

SPC (State/Province/Country) total for all bands. The same station may be worked on multiple bands for QSO points and SPC credit.

Power Multiplier:

>10 Watts = x1
>2 - 10 Watts = x7
>500mW - 2 Watts = x10
>100mW - 500mW = x15
100mW or less = x20

Suggested Frequencies:

80m	3985 kHz
40m	7285 kHz
20m	14285 kHz
15m	21385 kHz
10m	28385 kHz

Bonnus Points:

If you are operating PORTABLE using battery power AND a temporary antenna, add 5000 points to your final score. (You can NOT be at your shack operating from battery power using your home station antenna to qualify for this bonus.) This is to help level the playing field for contesters who work from the field against contest stations with 5 element yagis at 70 ft.

Score:

Final Score = Points (total for all bands) x SPCs (total for all bands) x Power Multiplier + Bonus Points

Categories:

Entry may be All-Band, Single Band, High Bands (10m-15m-20m) or Low Bands (40m-80m)

How to Participate:

Get on any of the HF bands except the WARC bands and hang out near the QRP frequencies. Work as many stations calling CQ QRP or CQ CONTEST as possible, or call CQ QRP or CQ CONTEST yourself! You can work a station for credit once on each band.

Deadline:

Entries must be postmarked on or before 12 February 2012.

Results:

Will be published in *QRP Quarterly* and shown on the QRP-ARCI website.

Certificates:

Will be awarded to the top scoring entrant in each category. Certificates may be awarded for 2nd and 3rd place if entries are sufficient in a category.

2012 QRP-ARCI HF Grid Square Sprint

Date/Time:

1500Z to 1800Z on 10 March 2012.

Mode:

HF CW only.

Exchange:

Members send: RST, 4 Digit Maidenhead Grid Square (i.e. FN02), ARCI member number

Non-Members send: RST, 4 Digit Maidenhead Grid Square (i.e. FN02), Power Out

QSO Points:

Member = 5 points
Non-Member, Different Continent = 4 points
Non-Member, Same Continent = 2 points

Multiplier:

Grid Square total for all bands. The same station may be worked on multiple bands for QSO points and Grid Square credit.

Power Multiplier:

>5 Watts = x1
>1 - 5 Watts = x7
>250 mW - 1 Watt = x10
>55 mW - 250 mW = x15
55 mW or less = x20

Suggested Frequencies:

160m	1810 kHz
80m	3560 kHz
40m	7030 kHz (also 7040 kHz for rock bound participants)
20m	14060 kHz
15m	21060 kHz
10m	28060 kHz

Bonus Points:

If you are operating PORTABLE using battery power AND a temporary antenna, add 5000 points to your final score. (You can NOT be at your shack operating from battery power using your home station antenna to qualify for this bonus.) This is to help level the playing field for contesters who work from the field against contest stations with 5 element yagis at 70 ft.

Score:

Final Score = Points (total for all bands) x Grid Squares (total for all bands) x Power Multiplier + Bonus Points

Categories:

Entry may be All-Band, Single Band, High Bands (10m-15m-20m) or Low Bands (40m-80m)

How to Participate:

Get on any of the HF bands except the WARC bands and hang out near the QRP frequencies. Work as many stations calling CQ QRP or CQ TEST as possible, or call CQ QRP or CQ TEST yourself! You can work a station for credit once on each band.

Deadline:

Entries must be postmarked on or before 24 March 2012.

Results:

Will be published in *QRP Quarterly* and shown on the QRP-ARCI website.

Certificates:

Will be awarded to the top scoring entrant in each category. Certificates may be awarded for 2nd and 3rd place if entries are sufficient in a category.

A Few QRP Contesting Suggestions:

- **Don't be timid! Call "CQ" and jump into pileups without hesitation!**
- **Make sure your rig and antenna are working well. Don't waste a milliwatt in extra loss.**
- **Contests are great for honing your operating skills—Learn how to time your calls, listen more carefully and judge band conditions. The result will be more QSOs.**

Advertise in *QRP Quarterly*!

There are many good reasons for your company to advertise in the official magazine of the QRP Amateur Radio International (QRP ARCI) club—the oldest and strongest ham radio club promoting QRP operating, homebrew construction, and the development of local QRP clubs!

Your support helps the club reach its goals of providing leadership in the QRP community, which has some of the most active and involved hams in the world. QRPers can't wait for the next issue of *QQ*!

Advertising Rates

Full color, full page ads:	Back cover (Cover IV):	$500	$450 (10%)*
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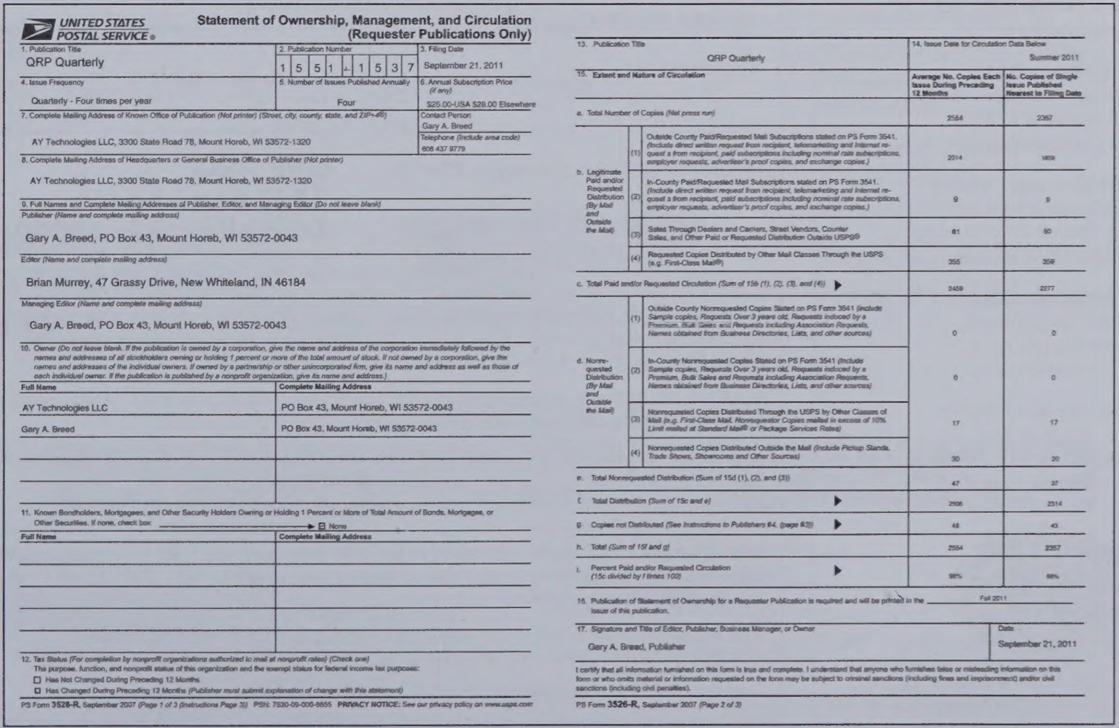

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13. Publication Title: QRP Quarterly

14. Issue Date for Circulation Data Below: Summer 2011

15. **Extent and Nature of Circulation**			**Average No. Copies Each Issue During Preceding 12 Months**	**No. Copies of Single Issue Published Nearest to Filing Date**
a. Total Number of Copies *(Net press run)*			2554	2357
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f. Total Distribution *(Sum of 15c and e)* ▶			2506	2314
g. Copies not Distributed *(See Instructions to Publishers #4, (page #3))* ▶			48	43
h. Total *(Sum of 15f and g)*			2554	2357
i. Percent Paid and/or Requested Circulation *(15c divided by f times 100)* ▶			98%	98%

16. Publication of Statement of Ownership for a Requester Publication is required and will be printed in the Fall 2011 issue of this publication.

17. Signature and Title of Editor, Publisher, Business Manager, or Owner Gary A. Breed, Publisher	Date September 21, 2011

I certify that all information furnished on this form is true and complete. I understand that anyone who furnishes false or misleading information on this form or who omits material or information requested on the form may be subject to criminal sanctions (including fines and imprisonment) and/or civil sanctions (including civil penalties).

PS Form **3526-R**, September 2007 *(Page 2 of 3)*

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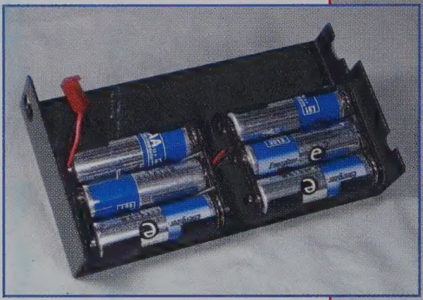

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